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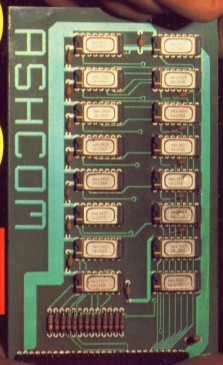

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– see page 119

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FULL STORY PAGE 33

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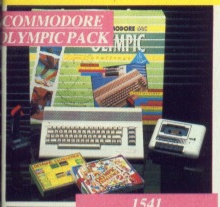

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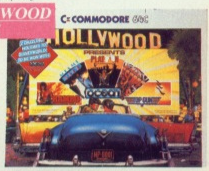

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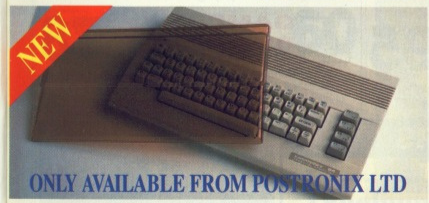

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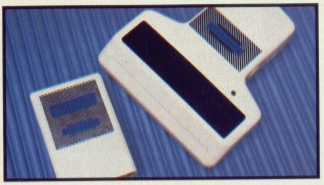


DAATASCAN 23

It's so big! Kempston's new hand-held scanner for the ST offers you 105mm wide scans. Scan the facts

COMPUTER VISION

Big Brother's could be watching you... discover how magic eyes, robots and cameras are changing the way computers see the world.

16

IS THE ADVENTURE DEAD? 53

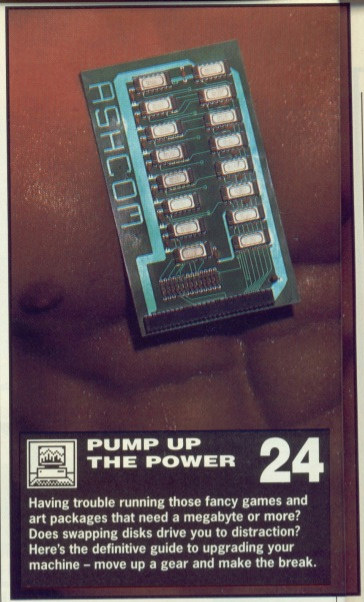
Have 16 bit graphics killed the art of adventuring? Discover what you're missing.

PERSONAL FINANCE MANAGER 47

Can't work out where it all goes to? Let your ST take the strain

AMIGADOS 1.3 95

It's finally here! Will your Amiga ever be the same again? Plus a preview of the new ST TOS.



PUMP UP THE POWER 24

Having trouble running those fancy games and art packages that need a megabyte or more? Does swapping disks drive you to distraction? Here's the definitive guide to upgrading your machine – move up a gear and make the break.

GAMES

SCREEN PLAY 66

Adventures strike back this month! Could *Ultima V* be the ultimate game? Or will *Populous* take the plaudits? Get the Format Gold verdicts here. Plus the definitive views of *Cybernoid II*, *Zak McKracken*, *Denaris*, *Titan*... if it ain't here, it ain't worth playing.

GAME BUSTERS 78

Honesty is the best policy. But if that doesn't work, here are 1001 back doors to your fave raves. Cheat your way to a high score overload.

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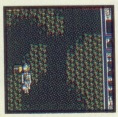

FORMAT SUPERDISK

The ST and the Amiga – two different machines, one superb disk. Don't just sit there, load it up and get going!

ST

ZAK McKRACKEN AND THE ALIEN MINDBENDERS

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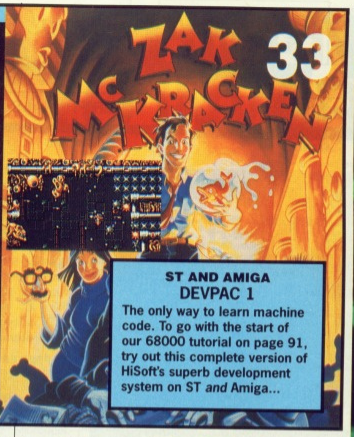
AMIGA

CYBERNOID II

Hewson's newest arcade smash – read the review, then experience five lives and a whole level's worth of mutant death! **PLUS:** *PrinText* for unlocking those text files



ST AND AMIGA

DEVPAC 1

The only way to learn machine code. To go with the start of our 68000 tutorial on page 91, try out this complete version of HiSoft's superb development system on ST *and* Amiga...

MUSIC

SAMPLERS ON TEST 13

Replay 4 (ST) and *AMAS* (Amiga) challenge the sound sampler market – tune in to our review.

OCEAN SHANTIES 42

If you've played *Rambo III*, *Platoon* or half a dozen other Ocean games, you've heard this man's music. Jonathan Dunn tells how it's done.

GRAPHICS

CYBER SCULPT 57

3 dimensional modelling comes to the ST. We check out this heavyweight graphics newcomer.

MOVIE SETTER 60

Gold Disk's newest offering aims to take the sweat out of animation. Does it do the trick?

ANIMATOR'S SECRETS 88

Starting a new four-parter on the who, why, where and when of animation techniques.

GREY MATTER

As far as computers go, America is generally seen as the place where it all happens. The ST and Amiga were designed in the States, and a high proportion of software development for the two machines goes on there.

Some American companies have links with companies this side of the big pond. Activision and Electronic Arts, to name but two. The U.S. software is shipped in and resold.

However, there's nothing to stop enterprising individuals ringing up the States, buying a load of stuff, shipping it over here and reselling it without any official sanction. Such deals are disparagingly called 'grey imports'. As was the case reported last month when Gainstar imported the US version of *Calamus* against Atari's wishes, these grey imports annoy the mainstream distributors. This is supposedly because (a) the U.S. version is often different to the U.K. version; (b) the importer (who just resells boxes as they arrive in the country) can't answer user's technical questions. But grey importers often get the product before the main distributor.

Companies feel that grey import versions of their software can unfairly give them a bad reputation. This is fair enough, and all moves to provide better support for users are to be welcomed.

However, it's grossly unfair that European users should be forced to wait many months for products that have been out in the States (eg. *Workbench 1.3* and *Calamus*). After all, putting a batch of boxes on a plane doesn't take long.

If distributors want to cut grey imports out, there is a very simple way to do it: ship the products in as soon as they are released in the States, and charge a fair exchange rate for them. Unless the finacnial markets have changed dramatically, $1 doesn't equal £1, despite what many suppliers would have you believe.

Let's have a fair deal for all!

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GFA GERMANY SET TO INVADE

- **GFA move to England**
- **Steinberg's plans for Amiga Pro-24**
- **Which? computer show report**
- **New paint pack ages battle it out**
- **Latest upgrades**

In a surprise move GFA System Tecknik of Germany are to open offices in England and take over the publishing and distribution of their products from current UK outlets. The British companies worst affected by this are Glentop Publishing and Microdeal. For over two years Glentop have been publishing a long line of GFA Germany's titles including *GFA BASIC, GFA BASIC Compiler, GFA Vector* and *GFA Draft.*

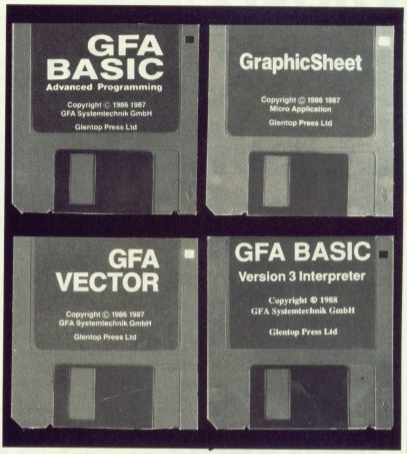
GFA Germany's plans first became apparent when they decided to publish the English versions of all Amiga titles and give the UK distribution rights to Microdeal. Amiga *GFA BASIC* is the only package to date to be handled by Microdeal. At the time the move surprised Glentop, and naturally Peter Holmes – Glentop's MD – was remorseful: "We publish products, we don't box-shift. System Technik used to send us the German version of a product and leave us to do the English translation and package the thing as we thought best. Our role was, and still is – until this affair is properly sorted out – as publisher and to support the end user. It's unlikely that Microdeal can provide proper customer service as the English version of Amiga GFA BASIC was put together in Germany.

"It's a shame GFA has decided to set up shop here... particularly after all our hard ground work. There's nothing we can do about it. It's perfectly legal according to the terms laid out in the contract.", continued Holmes.

This isn't the first time that GFA Germany have acted in this way. America was the first to be invaded; Michtron had to come to terms with it then, just as Glentop have to now. More recently, France has been the target of this ever-growing German company. GFA's sights are now set on England where they hope to do great things. An enthusiastic Rolf Hilschner, head of GFA System Tecknik, claimed: "I can't say who will be in charge of the English operation, but we expect to cause the same stir in the computer world as Aha caused in the Pop world."

Because of the turmoil created by GFA's announcement, Glentop won't release any further GFA titles until the situation has been clarified. A disgruntled Holmes said, "GFA RayTrace, amongst other things, has been delayed due to GFA's action, and it's unlikely we shall continue work on this until we've had further talks with GFA. As a result, we've been pushed into other markets sooner than we would have liked. We're moving into the PC marketplace; it's unlikely we'll do much on the ST and Amiga."

Whether GFA's move to Britain will be good for the UK serious software scene remains to be seen. GFA are confident it will.



■ ***A selection of GFA System Technik's products that will be distributed exclusively by the German company when they set up camp in the UK sometime in July. Rolf Hilshner, head of GFA, has high hopes: "...we expect to cause the same stir in the computer world as Aha caused in the Pop world."***

■ ***Readers worried about support for GFA products can expect the same level of service from Glentop and Microdeal up until July. After that things are as yet uncertain. If you find either company unwilling to help, or you can't get an answer to a problem regarding software, then contact GFA User at 186 Holland Street, Crewe, Cheshire, CW1 3SJ. The club supports all GFA products and is in constant communication with GFA Germany.***

DEVPAC FOR DEVELOPERS

Hisoft's Andy Pennell is currently working on a developers version of the widely acclaimed Devpac assembler/debugger/linker package. Along with all the traditional features of Devpac 2, the developers kit promises to allow you to produce Amiga file formats from an ST and vice versa. On top of this you can connect two machines via the parallel port and assemble directly to the slave computer, run a program on one machine and view debugging information on another.

Only alpha test versions of the package are available. Along with the programmers at HiSoft, Ocean's John Brandwood is the only person to be using the alpha system. Because the package is in such an early state of development no prices or release dates are yet available.

■ ***HiSoft, The Old School, Greenfield, Bedford, MK45 5DE (0525 718181)***

STEINBERG CHANGE THEIR TUNE

After months of petitioning by computer users worldwide, Steinberg have decided to go ahead and develop an Amiga version of their hugely successful *Pro-24* sequencer. A beta test version was previewed recently at Frankfurt; it is expected that the final version will be available in the UK sometime within the next two months.

Pro-24 is regarded as the industry standard sequencer. *Pro-24 V3* boasts score editing, transposing and real time 24-track sequencing.

The Amiga version is expected to cost £250 which is £35 cheaper than the ST version. Evenlode Soundworks – the official distributers of Steinberg software in this country – can be contacted on 0993 89228.

AIR MILES FOR STS

■ ***Compumart of Loughborough are giving away 10 Air Miles vouchers with every 520 STFM Superpack sold. Compumart are located at Jubilee Drive, Loughborough, Leics, LE11 0XS (0509 610444).***

BATTLE OF THE PAINT PACKAGES LOOMS

■ ***Within the next month* Deluxe Paint I *and* Photon Paint *will be upgraded. DPIII and PP2 are set to blow your mind.***

Two major art packages for the Amiga, *Photon Paint 2* and *Deluxe Paint III*, are set to storm onto the scene sometime in the next month. Earlier incarnations of both packages have been taken seriously by professional animators and artists who recognise the immense power they provide.

Activision will be selling Microillusion's *Photon Paint 2* at £85.99 just as soon as it arrives from the States. Upgrading from earlier packages should be possible, but details haven't yet been finalised.

Photon Paint contains many standard drawing functions along with its own proprietry features. Standard options include a range of brush operations, luminance with definable source location and intensity, flood and background fill as well as surface mapping.

Some of the new features promised in version 2 consist of contour mapping (the ability to wrap a brush around a 3D landscape); shadowing with adjustable size and offset; stretch brush functions; multiple swap page with animation thrown in; alternative drawing sources such as rub-through, Pantograph and brush patterns; air brush with definable spray area; fill polygon and polygonal brush cutter. For the really dedicated there's also a stencil for protecting certain areas as well as gradient colour spreads.

Both animation and painting facilities are purported to be present in Electronic Arts' *Deluxe Paint III*. A new technique called AnimPaint will be included which allows the user to draw a series of screens in much the same way as a single screen would be created. It's possible to define a brush, determine the distance for it to travel (in three dimensions), its rotation (about three axes) and the number of animation frames across which the movement wil be drawn.

Additional functions include extra halfbrite (this makes it possible to paint in 64 colours rather than 32); wrap mode in which a brush can be wrapped into any shape; tint mode for colourising black and white images; direct overscan painting; access to any number of fonts, styles and sizes. The price will be £79.99. Upgrading from *DPII* looks likely to cost £30 while upgrading from the *DP* will cost £50. *Deluxe Paint III* requires 1Mbyte of memory.

■ ***Activision (Photon Paint 2), Blake House, Manor Farm Road, Reading, Berkshire, RG2 0JN (0734 310003).***
■ ***Electronic Arts (Deluxe Paint III), Langley Business Centre, 11-49 Station Rd, Langley, Berks, SL3 8YN.***

UPGRADES

Here are the latest additions and bug fixes to popular packages. Software houses, let us know what improvements you've made to your products so that we can mention them in these pages. *Multiface ST 1.40, Romantic Robot, 01-200 8870 – now is invisible to most software and is consequently more successful, instant saving feature, completely different operational procedure, bug fixes. Devpac 2 Amiga 2.12*, HiSoft, 0525 718181 – bug fixes in the debugger and the addition of optomising features in the assembler. These optomising facilities aren't yet available in the ST version.

QUICKIES

■ **ST GFA System 2** from Glentop (01-441 4130) combines *GFA Basic V2* and *GFA V2 Compiler* in one package. The new £49.95 price compares very favourably with the original cost of the two items: £45.95 each.

■ The **Premier Collection** from Hewson consists of four of their earlier game releases: *Netherworld, Nebulous, Exolon* and *Zynaps*. Cost is £29.95.

■ Ariadne Software, notable for the *Kickstart Guide to the Amiga* and the *BBC Emulator*, have released **OPUS-1 MCL** for the Commodore Amiga. It allows music structures and tracks to be easily defined with text. The result is compiled to form a standard IFF-SMUS music file. The file is claimed to be compatible with all other IFF music programs. *MCL* is priced at £99.95 and is available from 273 Kensal Rd, London (01-960 0203).

■ Amiga **Sound Quest** is now being distributed by Computer Music Systems of Middlesex. *Sound Quest Editors* start from £79.95 and are available for DX11, D10, D50, K1, SQ80 and CZ synthesisers amongst others. Music Systems also provide a range of music education packages for musicians who've never learnt to read music. Prices start from £29.95. Further details on 01-977 4546.

■ **Lattice C++ Compiler** now includes documentation for the standard *Lattice C* library. The new literature provides a synopsis of each C function's use as well as a description of the function's purpose, the return value provided by the function and a cross reference to other related functions. The suggested retail price of *Lattice C++* remains at $500. Contact your local Lattice distributor or Lattice direct on 0101-312 916 1600.

■ The London Arena will house **Presentations '89**, an integrated computer and video graphics show, from October 4th to 6th. Database Exhibitions, organisers of both the Atari and Commodore shows, will be running the show alonside the 1989 Desktop and Professional Publishing show. Information on 0625 879970.

■ **Rombo Productions** have moved to 11 Crofthead Centre, Dedridge, Livingston, Scotland (0506 414631).

■ Three more products have been added to Electric Distribution's extensive range of add-ons for use with *Cyber Studio*. The **Video Titling Design Disk** provides professional finishing touches to cartoons. A 3D font and lots of 3D objects are included in this £29.95 package. **3D Fonts 1** and **11** are the other two products from Electric, both retailing at £29.95. The *Fonts* packages provide numerous fonts and 3D objects together with a font designer. Electric are on 0480 496666.

■ Silica Shop are now distributing **Megavision**, a 19" high resolution monitor for connection to an ST. This is particularly useful for DTP users since a an entire A3 page will easily fit on screen. Any well-behaved GEM program – such as *Datamanager Professional, Fleet Street Publisher, PageStream* (when it arrives) and *Timeworks DTP* – will make use of all the extra screen space. Price is £1953.85. Silica can be found on 01-309 1111.

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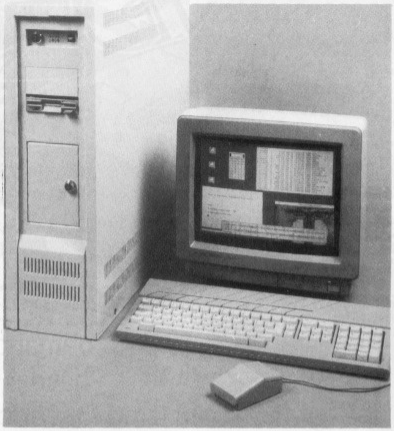
ANY WHICH WAY

Demonstrated at the recent Which? show was Atari's Transputer Workstation (ATW). The machine is finally cased and ready to go. After a prolonged gestation due to troubles with its multi-tasking operating system, Helios, the floor standing tower machine should start selling in April.

For around £4000, the ATW will incorportae a single T800 transputer running at 20MHz and delivering 10 mips of raw graphics processing power. While the transputer churns out mandlebrots and mandrels with spectacular speed, all I/O is handled by a friendly 68000 runing at 8Mhz. The transputer has access to 4Mbytes of RAM, which can be increased to 16Mbytes internally, while the 68000 can also address 4Mbytes of video memory.

On a more mundane level, the ATW comes with RS232, parallel printer port, DMA and MIDI sockets, single 3.5" or 5.25" floppy and SCSI connector for a 40Mbyte hard disk. The machine is designed to work with Atari's current range of peripherals.

Helios seems to working properly and can handle up to 13 T800s internally, with no limit if you add them outside the case. Helios is largely Unix compatible and comes complete with X-Windows 1.1. All sorts of languages including C, Fortran, Modula 2 and Occam.



■ ***Atari's Transputer Workstation as demonstrated at the recent Which? show. Full production should start in April. The graphics processor, called Blossom, is capable of some stunning screen resolutions: 1280 by 980 using 16 colours from a palette of 4096, 1024 by 760 using 256 colours from a palette of 16 million, 640 by 480 using 256 colours from 16 million and 512 by 480 in 'true colour'.***

■ ***The latest word on the Laptop ST is that the design is now complete and the finished machine should be seen in April (nothing was visible at the show). One of the main problems has been coping with left-handed users, who have to adjust to a tracker-ball rather than the mouse, star of the desktop ST.***

AMIGAS UNDER THE WEATHER

Commodore had little new to show for the Amiga range, but there was mention of several projects under development. Most interesting to A500 users is the A590 Hard Drive Plus. The A590 supports autoboot, making it possible to boot the system from a hard disk without the need for floppy. It's possible to add memory to the A590, improving the capabilities of the A500.

The drive is some way off and the preliminary specifications are likely to change. The current specification runs like this: 20Mbyte hard drive; sockets for up to 2Mbytes of RAM (chips can be installed in 512K, 1Mbyte or 2Mbyte amounts), 80ms access time, SCSI connector which can accept a further seven devices, external power supply that turns itself off when the A500 is powered down and a built-in fan.

Oddly Commodore were hyping several software packages for their yet-to-be-released transputer card for the Amiga A2000. The development packages ready include *Helios C* (£750), *Meiko Fortran* (£750), *Prospero Pascal* (£640), *Rowley Modula 2* (£995) and *BLS Basic* (£485) are now available for Commodore's Amiga Transputer Card. No release date for the transputer card yet.

The Birmingham Weather Department were there demonstrating how they use an A2000 to bring hourly weather forecasts to millions of television viewers. The Department have programmed the Amiga to capture and process imagery from a meteorological satellite over the equator. A team of weather experts use Amigas to create forecast captions as well as scripts to go with them. The complete weather presentation packages are sent down private data circuits to television studios where another Amiga receives them. The studio Amigas are genlocked and the whole show is played live

Report by Simon Williams

VIRUS DESTRUCTION KITS

Good news for users wanting to rid/protect their software from virus attacks: DevWare in the States have released Amiga *Anti-Virus* while UK-based Excel are distributing *Virus Destruction Utility* for the ST.

Anti-Virus, at $39.95, prevents viral damage, monitors all possible virus transmission paths and checks for trojan horses along with bootblock viruses. It claims to provide protection against all viruses.

VDU, meanwhile, retails for the more realistic figure of £6.95 and recognises virtually all software that uses the disk's boot sector (prevents game bootloaders being immunised) along with all known ST viruses (both bootsector and the link variety). Other options exist for repairing damaged bootsector software, immunising disks against viruses and fixing damaged bios parameter blocks.

■ ***Excel Software, PO Box 159, Stockport, SK2 6HN (061 4569587).***

■ ***DevWare Inc, 10474 Rancho Carmel Dr, San Diego, CA 92128, USA (0101 619 6730759).***

■ ***Palace warn that the pirate version of their pre-release Amiga SEUCK – which is a very early version that is unable to produce stand-alone games and won't be compatible with the final version – has a nasty virus that appears to be immune from most virus killers. The release date for the Amiga version has been put back several months, but claims to contain a myriad of extra facilities.***

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Some products due for imminent release are: **HiSoft C**, **KnifeST** (the ultimate disk recovery system), **Tempus 2**, **HiSoft FORTH** and, something quite exciting for us, **ProFlight** - a supremely accurate and flyable Tornado flight simulator for both the ST and Amiga.

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PC
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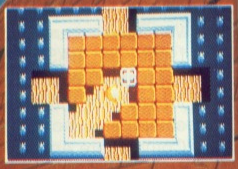

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TUNEFUL TWAIN

Sound sampling widgets are in no short supply for the ST and Amiga. Two recent pretenders to the throne offer much that is new. RICHARD MONTEIRO snatches musical ditties with them.

MUSIC

REPLAY 4

£79.95 ■ All STs ■ Microdeal, Box 68, St Austell, Cornwall, PL25 4YB (0726 68020)

here's seemingly no end to the cascade of sound samplers released for the ST. *Replay* isn't new, the 4 is. Version 4 is a major upgrade from previous models, and includes new hardware circuitry and completely revamped software.

The *Replay* hardware, which is mouse-sized and consists of nothing more than a couple of phono sockets slots, fits into the ST's cartridge port. Grabbing sound is just a matter of running a lead from the phono-in socket of *Replay* to your CD, record, tape or whatever (you can't use a microphone unless you first run it through an amplifier). The software is responsible for converting analogue sounds into digital equivalents and storing the result in the computer's memory.

Sound is sampled at 8-bit resolution (see the margin note for an explanation of this) and at any of eight different frequencies. Sampling frequencies are 5, 7.5. 10, 15, 20, 30, 40 and 50kHz. Frequencies are preset; you can't choose anything between the provided frequencies. Sounds can be sampled and replayed at any rate. So, you could sample at 10kHz and replay at 20kHz. The result would be a high pitched, Micky Mouse-like sound.

WHAT'S NEW IN REPLAY 4?

The most obvious improvements over the original *Replay* are the restyled packaging, thicker manual and recased sampling hardware. The hardware now sports a phono-out socket alongside the phono-in. Phono-out is for directing grabbed sounds to an external hi-fi for extra quality. With better use of menus, the version 4 software not only looks more pleasing, but it also performs better. The maximum sampling/replay rate has gone up to 50kHz, sample-input triggering is adjustable, low-pass filtering is possible, there's a real-time oscilloscope for monitoring incoming sounds, a spectrum analyser is included, waveform display is selectable and 10 samples can be held in memory.

You can play samples over an external MIDI instrument such as a sequencer or synthesizer. Real-time frequency (pitch) shifting is possible.

Finally there's inclusion of the *Drumbeat* software. With *Drumbeat* you can load 16 samples into memory – drum sounds are provided; bass, snare, hi-hat, cowbell, clap, bongo – and sequence the sounds. Samples can be played back via two channels. Many drum machine facilities are included.

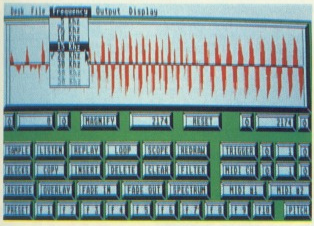
Cross talk

It's not possible to replay samples at 40 or 50kHz through the ST's speaker – that would be asking too much of the system – but going through a hi-fi gives spectacular output.

Along with the usual block copy, merge and delete options, there is provision for filtering sound (high frequencies are removed), reverse playing a sample, fading sound in and out, analyzing a spectrum graph in real-time, magnifying the sample graph and viewing the sample graph in various ways.

Once you're happy with a grabbed sound, there is fantastic provision for incorporating digitised ditties into your own programs. Source files in GFA BASIC, HiSoft BASIC, Atari BASIC, FAST BASIC and 68000 assembler are present and well documented. It's a pity, though, that the routines don't let you replay samples as a background task.

Replay 4 offers virtually everything you might need; sampling, effects generation, MIDI control and even drum sequencing. As such, it is great value compared to similar offerings. The manual lets the side down as it lacks illustration and is dry reading. Apart from that though, *Replay* is a winner.



■ Replay 4 *software in the flesh. Restyled option selection means the package is much easier to use. It also boasts new features for filtering, analysing and overlaying sounds.*

REPLAY 4

for

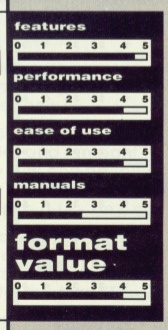
- Sampling up to 50kHz
- Drumbeat and MIDI software are welcome extras
- Lots of examples demonstrating how to include samples in your programs

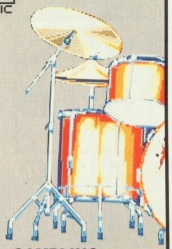
against

- Sampling frequencies are preset
- Effects software should be part of main program

REPLAY DELUXE

As if *Replay 4* wasn't enough, another new version, *Replay Deluxe* is coming soon. The hardware will feature a 10-bit analogue to digital converter, 12-bit digital to analogue converter and anti-aliasing filters. On the software side of things there is promise of full MIDI control, real-time fast Fourier transformations, sample frequency from 5kHz to 48kHz, two and four times oversampling and loads of real-time effects (echo, reverb and so on). Price will be £150.





SAMPLING SENSE

Samples are represented in memory 'digitally', ie. by numbers. Samples stored on CD are stored in a 16-bit number, so have 65,536 measurable levels... that explains where the term 16-bit sampling comes from. The more levels that can be measured (ie. the more bits per sample) the higher the quality. Most sampling hardware for the ST and Amiga offers 8-bit sampling, which gives 256 levels.

THAT'S INTERESTING

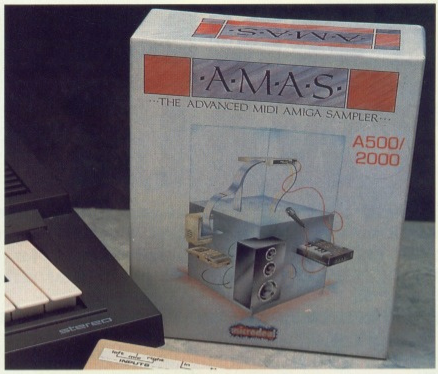
The author of the *AMAS* sampling software just happens to be the author of the *Replay 4* software. And it just happens that the author of the *Replay 4* software is also the author of the ST *Pro Sound Designer* software. But most interesting of all is the fact that the author in all three cases is called F Rawasi. Come on F, you can tell us your real name.

AMAS

£99.95 ■ All Amigas ■ Microdeal, Box 68, St Austell, Cornwall, PL25 4YB (0726 68020)

Not another sound sampler for the Amiga! Yes, but this one purports to have the lot. The hardware – which can connect to the serial or parallel port – offers mono and stereo sampling from either powered or non-powered sources. That means you can grab sound from your hifi (which is generally amplified) or from a non-amplified source like a microphone. In addition, there's MIDI in, MIDI out and MIDI thru ports. Then there's the software...

The main screen is split into five parts: memory bank selectors; twin sample edit windows; dual oscilloscopes for left and right channels; display, sampling and volume controls, and editing controls. The 'scopes work in real time – that is, they display sound information as it arrives.



AMASsing data

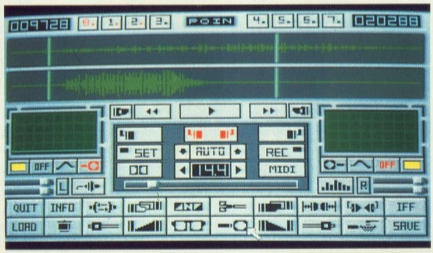
From the main control panel it is possible to select left, right or stereo sampling; set the sampling frequency; monitor and analyse incoming sound; record and play samples, and individually alter the volume of all four output channels. It's also possible to switch off the Amiga's internal sound filtering from here. Sound will be considerably less muffled when the filtering is switched off as the sound will have a wider bandwidth. (Unfortunately this facility doesn't work with all Amigas as not all Amigas are built equal.)

Editing functions include swapping a portion of sample contained in the left channel with that of the corresponding area in the right channel, overlaying samples on top of each other, reversing a sample, fading in and out, magnifying and the usual block operations.

It's possible to compress sample data by 25%, 50% or 75%. If you decided to squeeze a 10kHz sample by 50%, you must also reduce the playback frequency by 50% (in this case down to 5kHz).

Data can be saved in either IFF or raw format. This means that samples produced with AMAS can be used with a wide variety of other sampling software. This is just as well because no utilities are provided for adding sampled sounds into your own programs. It's unforgivable in a £100 package.

AMAS certainly offers almost everything necessary for sampling sounds and playing the results across a MIDI keyboard. MIDI and sound sampling for under £100 is unbeatable value. ■



■ ***AMAS lets you sample sound in either stereo or mono. Stereo sampling frequency can be anything up to 25kHz; playback frequency is a fraction higher at 28kHz. Eight banks of 200K can each hold 10 stereo samples – of course,***

features 0 1 2 3 4 5

performance 0 1 2 3 4 5

ease of use 0 1 2 3 4 5

manuals 0 1 2 3 4 5

format value 0 1 2 3 4 5

AMAS

for

- Software looks sexy and is easy to use
- Excellent compression and filtering options
- Good range of MIDI utilities

against

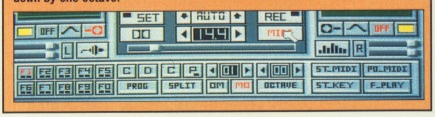
- No tools for adding samples to your own programs
- Can only use 2Mbytes of memory at most

MIDI AND THE AMIGA

A wealth of MIDI facilities are available from within the *AMAS* software. The options appear as a control panel over the existing editing panel.

Options exist for assigning samples to function keys, splitting a MIDI keyboard so that more than one sample can be played over the keyboard range, selecting a MIDI channel in the range 1 to 16 and transposing an incoming note either up or down by one octave.

There are several modes of operation: ST MIDI, ST KEY, PO MIDI, F PLAY. ST MIDI allows up to two stereo samples to be played from the MIDI input. ST KEY enables you to play stereo samples from the computer keyboard. Up to four mono samples can be played simultaneously in PO MIDI mode. F PLAY lets you play samples by pressing the relevant function keys.



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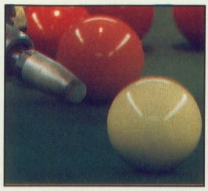
■ *It will be a long time before we can produce a robot like C3PO capable of reliably distinguishing between Han Solo and Princess Leia by sight alone.*

EYE SPY



Combine sight and artificial intelligence and you get an idea what the latest technology has to offer – smart machines that know what to do when they see what they like. MATT NICHOLSON goes in search of the applications these devices are being used for and discovers uses both frightening and frivolous.

At a recent symposium on biological and artificial intelligence systems the difference between the animal and the silicon kingdom was highlighted by a discussion on how a frog manages to catch a fly. The frog is not an animal endowed with a great deal of intelligence, yet this simple act is beyond even our most powerful supercomputers.

The problem is not so much in catching the fly, but in identifying it in the first place: by the time our computers have managed to deduce that a particular patch of moving light is a fly, the fly would have long gone. Computer vision – the design of computers and robots that can understand visual images – is a very young science; dating perhaps from 1978 when the first book on the subject was published reporting the Symposium on Computer Vision and Sensor Based Robots held at General Motors Research Laboratory in Michigan. Spot welding and paint spray robots provided the breakthrough for non-sensory robot design thus transforming the car production line. Robots that could sense their environment and use intelligent control were the next step.

Applications for such robots are everywhere, taking over mundane or repetitive jobs or working in hazardous surroundings. First generation robots are fine on a production line where every action is pre-programmed to a guaranteed environment, but they are unable to react to changing circumstances because they cannot see. There are already robots on production lines that can distinguish machine parts randomly positioned and orientated on a moving conveyor belt and detect any irregularities in shape – Consight, detailed elsewhere, is an example.

Another experimental example uses a TV camera poised above a tray of randomly distributed chocolates. A robot arm equipped with a piping nozzle is used to decorate the chocolates; the equipment can not only adapt to position and angle but also distinguish between a hazelnut slice and a rum truffle by their different shapes.

A rather more specialised area is Optical Character Recognition, or OCR. The ability of a computer to

A PLACE FOR THE 68000

The high-speed analysis of binary pictures, let alone grey-scaled images containing information in all three dimensions, involves huge processing power; so it is not surprising that much research is going into the development of systems that use parallel processing and neural network technology. The Inmos Transputer is the obvious candidate here, nevertheless one of the most popular machines for the researcher is the Sun workstation which uses the 68000 processor.

The Commodore Amiga and Atari ST are really not powerful enough to analyse visual input unless the images are very sparse. Nevertheless Personal Robots Limited, who developed the Atari Robokit system covered in an earlier issue, is developing a vision system along with other additional robotic extensions for this kit. This will come with sensor and image processing software, but will not be available until the end of this year. Personal Robots Limited is on (0491) 578001 if you would like further details.

read printed characters would save an immense amount of time in business; while the ability to read handwriting in the same way that we can would revolutionise the use of computers. Most image recognition systems rely on imposing a known template over the image and looking for a match. The problem is the huge variety of shapes and sizes that we understand to be the letter A, for example, as opposed to the letter H. We are all familiar with the rather ungainly characters found along the bottom of a cheque, although nowadays the more acceptable OCR-B typeface is used. There are expensive machines available that can read a small range of typewriter faces too.

Some research was done in this area a number of years ago by the Home Office, who developed a system that could automatically read car number plates from a camera mounted below a motorway bridge. At first sight this seems challenging, particularly given Britain's inclement weather and the average standard of motorway driving; but remember that number plates are retro-reflective, and so can be highlighted by an infra-red light source mounted near the camera. Such systems do not prove terribly reliable though, and the system is not in use today.

New arms race

A particularly hazardous environment is a battlefield, especially if you happen to be at the end of a missile heading towards its target. The military is obviously interested in computer vision as a method of targeting, but what is perhaps not so obvious is that they are also looking for value for money. After all, a successful system is completely obliterated the first time it is used – along with the target of course.

NATO is particularly keen on what is called the Deep Strike System as an alternative to tactical nuclear

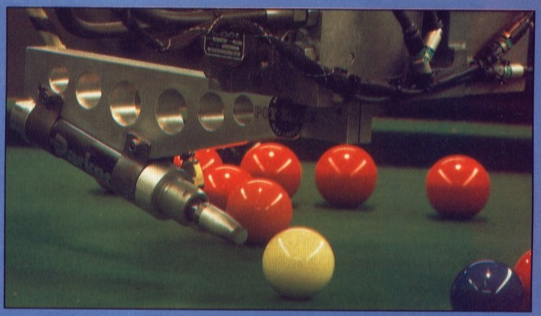
■ *The addition of visual and tactile senses to a programmable robot arm would be of enormous benefit to industry. This project uses vision systems from Joyce-Loebl Limited of Tyne & Wear to select randomly placed machine parts and put them in a specified position and orientation.*

SERIOUS PURSUIT?

Researchers at Portsmouth polytechnic have developed a pair of robots that can play table tennis together. Their next objective is to get the pair to play in the dark... Meanwhile at the Advanced Robotic Centre in Salford, development is proceeding on an automatic lawnmower. Early prototypes tended to mow the flowers as well as the grass...

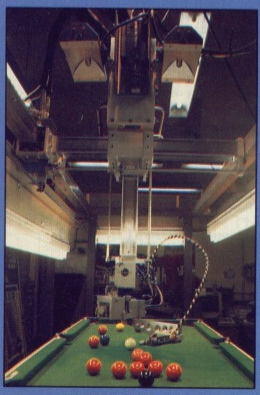
SNOOKER-PLAYING ROBOT

One of the more famous applications of robot vision is in this robot at the Department of Mechanical Engineering, University of Bristol. It was called 'Robopot' by the BBC during filming for the QED program, although the Vice Chancellor calls it 'Mikado'. It is the brain-child of lecturer Koorosh Khodabandehloo together with researcher Ian Rennell. Conceived in 1985, it was put together through 1987 and in February 1988 played against professional player Ted Lowe. "We lost," said Koorosh, "but as far as we were concerned we had won!"



The aim of the project is to provide a test bed for constructing an Expert Robot System; a concept that has parallels with conventional expert systems in that the aim is to produce an expert 'shell' which could then be applied to a variety of other applications with minimum reprogramming. Snooker might seem like an odd choice for the test bed, but in fact it combines many elements that would be found in industry.

The robot uses two video cameras as eyes, one suspended high above the table to provide an overall view and one mounted on the mobile arm itself to provide a more detailed picture of the target ball. The cameras are black and white so grey scaling is used to determine ball colour, and the table is evenly lit by powerful strip lights on all sides so that shadows don't confuse the scene. Processing power is distributed through the system, with a dedicated automatic vision system using 68000 processors backed up by an IBM mini using six 8086 processors to control the robot itself.



The main problems were not so much in processing the visual information – determining where the balls are, in other words – but rather in developing software that could make intelligent strategic decisions by learning from previous shots. Snooker player Steve Davis has been helping build up a knowledge base for the system, and much has been learnt about the way a professional works. Steve never plays a table he has not practiced on before, for example, so the robot needs to learn about the table's characteristics as play progresses. Pot Black Limited, who supplied the table, has also provided useful input here.

A variety of specialised languages are used for the software, in particular RAIL and IBM's AML which are high-level languages rather like Pascal. Work is also being done with FRIL (standing for Fuzzy Relational Inference Language), an extension of Prolog developed by Dr Jim Baldwin of the Information Technology Research Centre at Bristol. This uses 'fuzzy logic', which allows decisions to be taken even when all the relevant data is not known or is uncertain.

Koorosh told us that, "From where I am standing industry can be said to be very supportive". Sponsors of the department's work include Westland Helicopters, British Aerospace, Rolls Royce, IBM, DTI and Ferranti. The Agricultural and Food Research Council is funding projects exploring the use of vision-guided robots in the food industry, where there is a shortage of skilled labour. Projects include a robot capable of cutting the meat from a carcass and slicing smoked salmon. The handling of non-rigid objects is another ball-game altogether.

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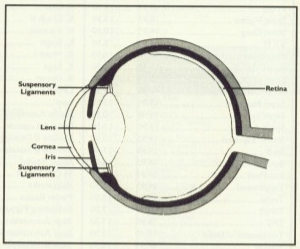
ST/AM 04

weapons for eliminating a tank invasion of Western Germany. This relies on computer vision in two ways. First of all there is the need for a system that can distinguish tanks on a radar screen; in particular to be able to distinguish reliably between the radar profile of a tank as opposed to a harmless truck at a range of 200km. Secondly there is the need for a missile that can target reliably.



■ *The ultimate technology – the human eye, on which we rely for 70 percent of our sensory input. The eye is unique amongst our sensory apparatus in actually doing a lot of the image processing itself before sending the result down the optic nerve to the brain. Behind the rods and cones that make up the surface of the retina is a network of neuron-like cells which each respond to particular types of visual stimuli.*

Early radar homing missiles proved successful, but very expensive. More popular now are 'skeet' missiles that wobble as they spin through the air, scanning an infrared sensor in a spiral pattern across the ground. Development takes time; ultimately the goal is not a system that works, but one the Russians think might.

What's the problem?

The problem is not so much in the sensory equipment as in the software behind it. There are a variety of sensors in use these days, ranging from simple linear or area arrays (that give a binary read-out depending on the presence or absence of light directly below each sensor) to high-resolution video cameras (able to resolve up to 1024 by 1024 pixels in 16 grey scales or even full colour). There are sensors that can see infra-red, radar, or even magnetic field strength. However the higher the resolution of the image the more processing power is needed to analyse it – or the longer the analysis takes.

In many cases high resolution is not needed for the task or an alternative solution, such as 'structured light', is more suitable. In the second case the scene is illuminated by a carefully designed light pattern, which is viewed by the sensor from a different angle so that the contours of the object displace the pattern in a controlled way – a popular solution in industry.

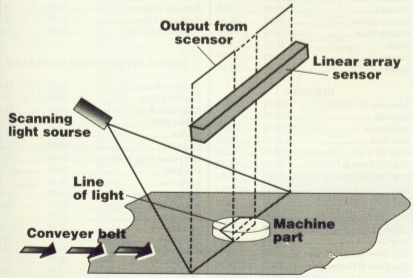
To understand the magnitude of the problem, imagine a situation where a series of known shapes of known sizes are randomly positioned on a surface at a fixed distance from a sensor, and that the sensor returns a simple binary image – ON indicating the presence of an object and OFF the absence. The first task for the software is to find the edge, using edge following algorithms, possibly after removing any noise from the image using Gaussian filter routines.

If the orientation of the shape is fixed then simple template matching might be sufficient to identify the object – this can usually be arranged if you are attempting to read OCR-B, for example. If the orientation is not known then you could resort to finding the radii signature of the shape. This involves first using an algorithm to find its centre, and then mapping the distance to the edge all round – a technique used in the chocolate decoration detailed earlier.

But what if the objects are touching? Or even overlapping? Further algorithms have been developed that can hypothesis the whole object provided it contains several occurrences of recognisable holes or corners. But imagine what happens when you introduce depth, so that parallax has to be taken into account; solidity, adding a third dimension; inconsistent lighting, so that shadows confuse the issue; and then start moving the sensor relative to the environment, as would happen if the robot got up and started walking around.

All of these problems are soluble, and indeed many have been demonstrated solved in research labs round the world. Systems that can respond to their environment consistently in a variety of surroundings, and at a useful speed, require very efficient algorithms and very fast processors. Research into parallel processing and neural systems will bring results here.

But it will be a very long time before a robot could walk up to you in the street, gently shake you by the hand and get your name right first time.



■ *The Consight system uses a linear array sensor to read the presence or absence of a line of light across a moving conveyor belt in a basic 'structured light' system. From its output a two-dimensional binary image of the object is built up out of 'time slices'. Image processing algorithms then work out the part's shape, size and orientation.*

SPEAKING THE RIGHT LANGUAGE

The language most often chosen to implement artificial intelligence (AI for short) is Prolog, standing for PROgramming in LOGic. This was developed in 1972 at the University of Marseilles from the concepts embodied in first order predicate logic. Programming in Prolog involves specifying the facts you know about objects and the relationships between them, specifying the rules that govern these elements, and then asking questions about the objects and the relationships. A common example is to input details of a family tree, such as 'Jim is John's brother' and 'Anne is Jim's wife', and then to quiz the program about the relationship between Anne and John.

Prolog is frequently used to build expert systems – knowledge bases containing detailed facts and rules about specialised areas. Much development work is being done with expert systems because they can prove commercially viable: a system called Prospector, for example, successfully identified a deposit of molybdenum in Washington State worth $100 million. Geologists given the same raw data did not find it.

The other popular AI language, particularly in the United States, is Lisp. Standing for LISt Processing, this is a derivative of Fortran developed in 1959 at MIT. Its aim was to provide a language that could process symbols in the same way that Fortran processes numbers; it is also useful for developing expert systems.

Specialised languages have been developed for particular needs. VAL, for example, is a high-level robot control language developed by Unimation Incorporated which makes the popular Puma industrial robot arm. It includes commands such as MOVE, DEPART and LOCATE. However many researchers opt for a medium level language such as EXTRA or even C for the speed it affords.

RAT RACE

Every year researchers in artificial intelligence meet at Bristol Polytechnic for a competition. There a maze is set up and the competitors race robot mice to see which can find the centre first.

clik-ST

Unit 2 Willowslea Farm,
Spout Lane North, Stanwell Moor,
Staines, Middlesex TW19 6BW
Telephone: (0753) 683965

We Accept FORMAT VOUCHERS

TITLE	S.S.P	OUR PRICE
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I Ball	9.99	7.50
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Knightmare	14.99	10.50
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Leatherneck	19.99	13.50
Leisure Suit Larry	19.99	13.50
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Night Raiders	19.99	13.50
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Trimbase	89.95	70.50

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Borrowed Time	29.99	12.50
Crazy Cars II	24.99	12.50
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Hacker	29.99	12.50
Hacker II	29.99	12.50
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Mindshadow	29.99	12.50
Moonmist	29.99	12.50
Offshore Warrior	24.99	12.50
Shanghai	29.99	12.50
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Tass Time	29.99	12.50
Trinity	29.99	12.50
Wishbringer	29.99	12.50
Ultima	24.99	12.50
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Zork II	29.99	12.50
Zork III	29.99	12.50

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Adventure Con Set	Electronic Arts	29.99	20.50
Alien Syndrome	Soliek	24.99	16.50
Annals of Rome	P.S.S.	24.99	16.50
Arcade Classics	Robtek	19.99	13.50
Arkanoid	Discovery	26.00	16.50
Armageddon Man	Martek	19.99	14.50
Army Moves	Ocean	24.99	16.50
Around the World in 80 Days	Pandora	19.99	13.50
Artic Fox	Electronic Arts	24.99	17.50
Bad Cat	Rainbow Arts	19.99	16.00
Balance of Power	Mirrorsoft	29.99	19.50
Barbarian	Palace	24.99	16.50
Bards Tale 1	Electronic Arts	24.99	17.50
Bards Tale II	Electronic Arts	24.99	17.50
Battleships	Elite	19.99	13.50
Bermuda Project	Mirrorsoft	24.99	16.50
Better Dead Than Alien	Elektra	19.99	13.50
Beyond the Ice Palace	Elite	24.99	16.50
Bionic Commandoes	U.S. Gold	24.99	16.50
Black Lamp	Firebird	19.99	13.50
Blackjack Academy	Microillusions	24.99	16.50
Bomb Jack	Elite	24.99	16.50
Bubble Bobble	Firebird	19.99	13.50
Bubble Ghost	Ere Inf.	19.99	13.50
Buggy Boy	Elite	24.99	16.50
Capone	Actionware	29.99	19.50
Carrier Command	Rainbird	24.99	16.50
Championship Golf	Gamestar	34.99	27.75
Chessmaster 2000	Electronic Arts	24.99	17.50
Chubby Gristle	Grand Slam	19.99	13.50
City Defence	Anco	14.99	10.25
Corruption	Rainbird	24.99	16.50
Crack	Linel	19.99	13.50
Craps Academy	Microillusions	24.99	16.50
Crash Garrett	Infogrammes	24.99	16.50
D Thomps Olympic Challange	Ocean	24.99	16.50
Defender of the Crown	Mirrorsoft	29.99	19.50
Dega Vu	Mindscape	29.99	19.50
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Dlemsiar	Microillusions	24.99	16.50
Eco	Ocean	24.99	16.50
Elf	Ubisoft	34.99	25.25
Emerald Mines	Anco	19.99	13.50
Empire	Interstel	24.95	17.50
Empire Strikes Back	Domark	19.99	13.50
Enlightenment	Firebird	19.99	13.50
Farry Tale Adventure	Microillusions	49.99	32.50
Ferrari Formula One	Electronic Arts	24.95	17.50
Fire and Forget	Titus	24.99	16.50
Fireblaster	Prism	9.99	7.00
Firepower	Microillusions	24.99	16.50
Flight Sim II	Sublogic	39.99	26.50
Football Manager II	Addictive	19.99	13.50
Formula One Grand Prix	Microvalue	14.99	10.25
Fortress Underground	Anco	14.99	10.25
Fusion	Electronic Arts	24.95	17.50
Garrison II	Rainbow Arts	24.99	19.50
Gee Bee Air Rally	Activison	19.99	13.50
Gettysberg	S.S.I.	39.99	19.50
Gigaroid	S.C.A.	14.95	10.25
Ice Hockey	Mindscape	24.99	16.50
Ikari Warriors	Elite	24.99	16.50
Interceptor	Electronic Arts	24.95	17.50
Indion	King Soft	19.99	13.50
Jet	Sublogic	39.99	26.50
Jewels of Darkness	Rainbird	19.99	13.50
Jinx	Rainbow Arts	24.99	19.50
Kampfgruppe	S.S.I.	49.99	22.50
King of Chicago	Mirrorsoft	29.99	19.50
Labrchel	Level 9	19.99	13.50
Leatherneck	Microdeal	19.99	13.50
Leatherneck's Player Adapter	Microdeal	5.50	4.50
Legend of the Sword	Rainbird	24.99	16.50
Major Motion	Microdeal	19.99	13.50
Marble Madness	Electronic Arts	19.99	14.50
Mean 18	Accolade	24.95	17.50
Menace	Psygnosis	19.99	13.50
Mindfighter	Abstract	24.99	16.50
Moon Mist	Infocom	29.99	19.50
Mortville Manor	Lencore	24.99	16.50
Motorbike Madness	Psygnosis	14.99	10.25
Obliterator	Psygnosis	24.99	16.50
Oil Shore Warrior	Titus	24.99	16.50
Othello	Robtek	9.99	7.00
P.O.W.	Actionware	19.99	19.50
Pandora	Firebird	19.99	13.50
Passengers of The Wind	Glenet	24.99	16.50
Phalanx II	Anco	14.99	10.25
Phantasie III	S.S.I.	24.99	19.50
Pinball Wizard	Kingsoft	9.99	7.00
Platoon	Ocean	24.99	16.50
Plundered Hearts	Infocom	29.99	17.50
Pool	Mastertronic	9.99	7.00
Ports of Call	Aegis	39.99	25.50
Powerplay	Ocean	19.99	13.50
Protector	Prism	9.99	7.00
Quadralien	Logotron	24.99	16.50
Red October	Argus Press	24.99	16.50
Return to Atlantis	Electronic Arts	24.95	17.50
Return to Genesis	Firebird	19.99	13.50
Revenge II	Mastertronics	9.99	7.00
Rockford	Melbourne House	19.99	13.50
Rolling Thunder	U.S. Gold	24.99	19.50
Romantic Encounters	Microillusions	24.99	16.50
S.D.I.	Mindcraft	29.99	19.50
Sacrophaser	Players	14.99	10.25
Sargon III	Sublogic	19.99	13.50
Scenery Disc 1	Sublogic	19.99	13.50
Scenery Disc 7	Sublogic	19.99	13.50
Scenery Disc Europe	Sublogic	19.99	13.50
Scenery Disc Japan	Sublogic	19.99	13.50
Scrabble	Leisure Genius	19.99	13.50
Sentinal	Firebird	19.99	13.50
Seven Cities of Gold	Electronic Arts	14.95	10.25
Shadowgate	Mindscape	24.99	16.50
Sidewinder	Mastertronics	9.99	7.00
Sinbad and The Throne of Falcon	Mindscape	29.99	19.50
Skychase	Imageworks	19.99	13.50
Skyfox II	Electric Arts	24.95	17.50
Space Quest	Sierra	29.99	19.50
Space Station	Prism	9.99	7.00
Star Glider 2	Rainbird	24.99	16.50
Star Wars	Domark	19.99	13.50
Starfleet 1	Interstel	24.95	17.50
Starray	Logotron	24.99	16.50
Stir Crazy (Bobo)	Infogrammes	19.99	13.50
Stock Market	Tynesoft	19.99	13.50
Street Gang	Players	14.95	10.25
Streetfighter	U.S. Gold	24.99	19.50
Strikeforce Harrier	Mirrorsoft	24.99	16.50
Strip Poker II	Anco	14.99	10.25
Strip Poker II Data Disc 1	Anco	9.99	7.00
Sub Battle Simulator	Epyx	24.99	19.50
Summer Olympiad	Tynesoft	19.99	13.50

TITLE	HOUSE	S.S.P	OUR PRICE
Swooper	Robtek	19.99	13.50
Tanglewood	Microdeal	19.99	13.50
Temple of Apshai	U.S. Gold	24.99	19.50
Terrapods	Psygnosis	24.99	16.50
Tetraquest	Microdeal	19.99	13.50
Thrxter	Sierra	24.99	16.50
Three Stooges	Mirrorsoft	29.99	19.50
Thundercats	Elite	24.99	16.50
Time and Magic	Level 9	24.99	16.50
Time Bandits	Microdeal	19.99	13.50
Tracers	Microillusions	24.99	16.50
Ultima III	Origin	24.99	16.50
Ultima IV	Origin	24.99	16.50
Uninvited	Mindscape	29.99	19.50
Vectorball	Mastertronics	24.99	16.50
Virus	Firebird	19.99	13.50
Vyper	Topdown	14.99	10.25
Warzone	Prism	9.99	7.00
Whirligig	Firebird	19.99	13.50
Wizzball	Ocean	24.99	16.50
Witness	Infocom	29.99	19.50
World Darts	Mastertronics	14.95	10.25
World Tour Golf	Electronic Arts	24.95	17.50
Xenon	Melbourne House	19.99	13.50
Zoom	Discovery	19.99	13.50
Zynaps	Hewson	19.99	13.50

IF YOU DON'T SEE IT ON THE LIST, THEN PLEASE ASK, WE CAN'T LIST EVERYTHING AVAILABLE

NEW RELEASES NOW IN STOCK

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Netherworld	Hewson	19.99	13.50
Robeary	Anco	19.99	13.50
Alternate Reality	Grand Slam	19.99	13.50
The Edge	Origin	24.99	16.50
Wizard Wars	Canvas	24.99	16.50
Chronoquest	Psygnosis	29.99	19.50
Battle Chess	Electronic Arts	24.99	17.50
T. Pursuit (New Beginning)	Domark	19.99	13.50
Basketball	Epyx	24.99	19.50
Nebulas	Hewson	19.99	13.50
Rocket Ranger	Mirrorsoft	29.99	19.50
Ingrids Back	Level 9	19.99	13.50
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Live And Let Die	14.28	14.28
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Galactic Conqueror	14.28	17.28
International Soccer	14.27	14.27
Pioneer Plague	N/A	17.27
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Manhattan Dealers	14.29	17.28
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Title	ST	Amiga
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F15	17.27	N/A
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Question of Sport	14.28	14.28
Galdregons Domain	14.28	14.28
M.C.C Pascal	57.41	57.41
Crazy Cars II	14.28	N/A
Captain Fizz	11.27	11.27
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Cybernoid II	15.28	15.28
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DAATASCAN

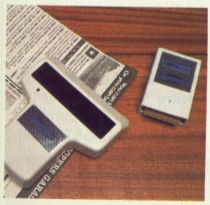
Getting artwork from paper onto the screen can be a real pain – unless you take the easy way. BEN TAYLOR tries his hand with Kempston's new extra width scanner.

REVIEW

£275 ■ All STs ■ Kempston Daata, 21 Linford Forum, Linford Wood, Milton Keynes MK14 6LY (0908 677886)

The trouble with all these fancy graphic programs that the ST and Amiga boast is getting pictures onto the screen. Maybe you've got a photo you want to include in a DTP page – scan it. Maybe you're trying to draw a picture in an art package – sketch it out on paper, scan it in and then retouch and colour it using an art package. In short, a scanner saves the budding artist hours of eye-boggling staring at a screen.

Kempston's *DaataScan* is a hand held scanner which you roll over a flat image to be captured. It's a rival to the Cameron scanners reviewed in issue 8, the big difference being that the Cameron *Handy Scanners* will scan a column 64mm wide, *DaataScan* will go to 105mm. That's a 60% increase, and it makes a big difference. You can scan normal sized photos easily.



Long range scan

The DaataScan interface plugs into the ST's cartridge port, and a 2 metre lead connects to the scanner itself. The hardware is a rebadged AMS scanner, as has been reliably supplied to PC users with AMS's own *Finesse* DTP kit for some months. There's a start/stop scan button, contrast control, and four scan modes for different types of image.

Kempston also supply a useful selection of software with *DaataScan*. First of all is a simple program to control the scanner – you can capture the input, then save any or all of it as a disk file. A pleasant surprise is that Kempston have bundled Atari's *HyperPaint* with the package, so you can use this to edit your images, resize, rotate and colourise to your heart's content. (We carried a full review of *HyperPaint* in issue 6.) *HyperPaint* can save in Degas, Neochrome or IMG file format, so you'll be able to convert scanned images for any DTP or art program.

It's so big

The DaataScan hardware works at 200 dots per inch resolution, and you can scan in any ST screen mode. (Scanning is always in black and white, whatever resolution you are in.) One potential problem is that 200 dpi on a 105mm scan width means over 800 pixels per row, needing three low resolution screen widths! There are commands to scale the size of the scanned picture down, but no 'zoom' commands to give you an overall view without actually altering the picture data.

Another bundled piece of software, 'IMAGEMOD', lets you add colours to low resolution scanned images.

All scans are saved in .IMG format, which means they can be of any size, limited only by memory. On a 520ST you can scan and save a strip about 10 inches long, more on a Mega. Another virtue of .IMG files is that, using *HyperPaint*, you can load an image saved in one resolution while working in any other.

Verdict

DaataScan is the first ST scanner to offer a 105mm window, and you'll appreciate the extra width. The results are good, although it would have been nice to have the option of 300 or 400 dpi resolution. Overall, the high quality of the software supplied makes it very simple and flexible to use.

■ *As well as scanning straight black and white line images like cartoons (inset), DaataScan gives you three 'dither' scan modes. These provide a simulation of shades of grey so that photographs can be captured with a reasonable quality.*

features 0 1 2 3 4 5

performance 0 1 2 3 4 5

ease of use 0 1 2 3 4 5

manuals 0 1 2 3 4 5

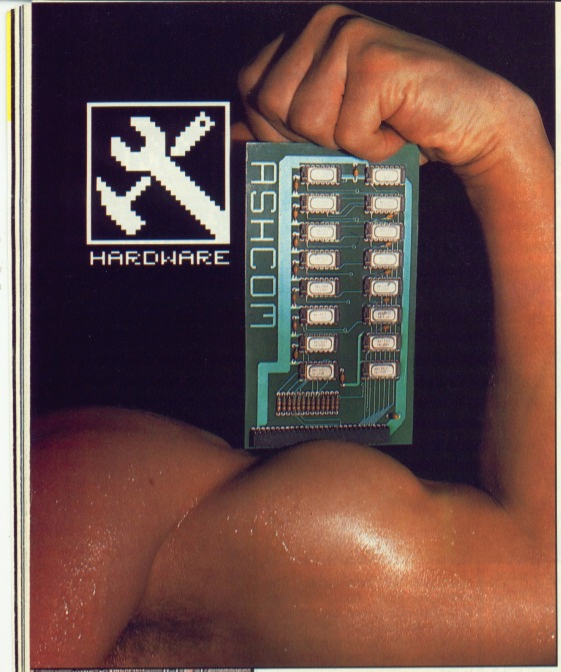
format value 0 1 2 3 4 5

for

- Works in all ST screen resolutions
- Bundled with HyperPaint
- Wide 105mm scan strip
- Length of scan as big as memory allows

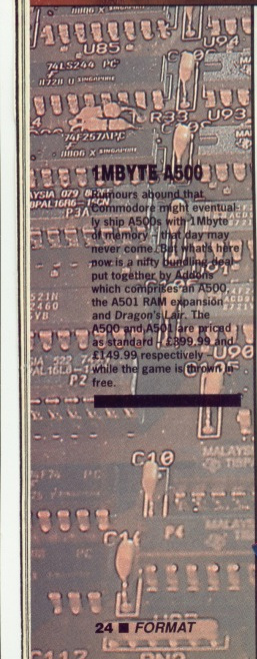
against

- Slight tendency for roller to slip giving horizontal breaks on scan
- No 300 or 400 dpi resolution option



MAKE IT BIG

512K is fine for games and a few of the smaller serious applications. For really big tasks, though, you need at least a megabyte of memory. And possibly a second drive. The number of games and applications that require loadsapower are on the increase, so don't get left behind – make sure you know what you need to get the best out of your machine. RICHARD MONTEIRO looks at what's available.



1MBYTE A500

Rumours abound that Commodore might eventually ship A500s with 1Mbyte of memory – that day may never come. But what's here now is a nifty bundling deal put together by Ashcom which comprises an A500, the A501 RAM expansion and *Dragon's Lair*. The A500 and A501 are priced as standard at £399.99 and £149.99 respectively – while the game is thrown in free.

RAM UPGRADES

It's worrying, the number of packages that require 1Mbyte of memory or more to run. On the ST games front there isn't anything that *needs* 1Mbyte, but there are several games that can benefit from extra memory. The games either load completely into memory (thus removing disk swapping) or provide better sound and graphics. For instance, *Gauntlet II* has an excellent introduction sequence when played on a 1Mbyte machine and *Typhoon*, which comes on two disks, loads completely in a 1Mbyte environment.

Already 1Mbyte-only games exist for the Amiga: *Dungeon Master* and *Dragon's Lair*. There's promise of plenty more.

As for serious applications, all the desirable software needs at least 1Mbyte. For example, *K-Roget*, *VIP Professional* and *Cyber Paint 2* on the ST; *Professional Page*, *Comic Setter* and *Deluxe Photolab* on the Amiga.

It's very likely that many more 1Mbyte software titles will be launched this year, and perhaps even 2Mbyte packages. Already there's rumour of *Calamus*, *Videoscape 3D 2* and *PageStream*. Of course, additional RAM isn't good just for running powerful software. It's useful for installing large RAM disks (to aid file copying), having memory hungry Desktop accessories alongside other applications or running lots of tasks simultaneously on an Amiga. So what do you do about the situation? You could forget about it and miss out on some very sexy software. Or you get yourself a RAM expansion board.

PRORAM 2000

£229 unpopulated ■ Amiga 2000 only ■ Amiga Centre Scotland, 4 Hart Street Lane, Edinburgh EH1 3RN (031-557 4242)

An 8Mbyte internal RAM expansion for the A2000. Definitely one for power users, and those with large wallets. ProRAM is provided unpopulated, and is user-upgradable in 2Mbyte increments up to the maximum 8Mbytes. The board makes use of 1Mbit DRAM chips; so it will cost you around £400 for every 2Mbytes of memory you add.

ProRAM will work with any mixture of 1Mbit DRAM chips. Hunt around before buying RAM chips; prices are so volatile and vary considerably from dealer to dealer. At the time of writing, the Amiga Centre Scotland could supply 1Mbit DRAMs for £24.15. Adding the chips to the board is easy enough if you take care handling the RAMs. Static will destroy the chips – and at around £25 per chip you simply can't afford to screw things up. Get a dealer to fit the chips; you may get charged a small fee, but that's peanuts compared to blown RAMs.

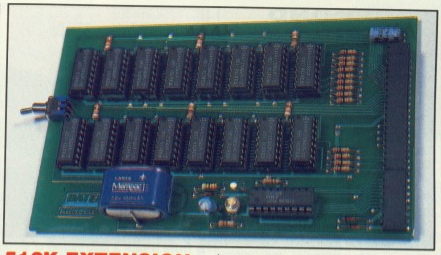
With the RAM installed, it's just a matter of correctly orientating some jumper leads. These tell the expansion board exactly how much memory it has; either 0, 2, 4, 6 or 8Mbytes.

The ProRAM board can sit in any of the five standard 'Zorro' slots inside the A2000. Before replacing the A2000 cover, it is wise to run a diagnostic test. This, along with other utilities, is provided on a disk. A link must be removed from the board for the testing software to run. This must be replaced before using the Amiga normally. The software will check the board and RAM; suspect memory banks and chip locations will be displayed. If you really must know, the checks include rotating bit, bit interaction, scatter and execution.

A recoverable RAM disk program is also included (there's one as standard in the new Workbench 1.3 anyway.) This works in much the same way as the standard Amiga RAM disk with the exception that any data held in the RAM disk remains intact after a reset. However, a bug in Workbench 1.2 means that the operating system will destroy the contents of the extra 512K memory in an A2000 located at C00000 (hex) regardless. If the recoverable RAM disk places any data in this area, then it may be lost during a reset.

ProRAM is a wonderfully engineered board. It sits inside the A2000 out of sight and out of mind. It is virtually identical to Commodore's A2058 RAM expansion board, but costs less (assuming you buy chips for no more than £32 each).

PRORAM	
features	3.5
ease of use	4.0
manuals	4.0
format value	3.5



512K EXTENSION CARD

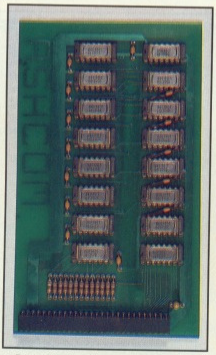
£19.99 unpopulated, £34.99 with clock, £100 extra for RAM ■ Amiga A500 only ■ Datel Electronics, Fenton Industrial Estate, Govan Rd, Fenton, Stoke-on-Trent, ST4 2RS (0782 744707)

Datel's 512K expansion card for the A500 comes in various configurations: standard unpopulated board, battery-backed clock/calendar unpopulated board, standard populated board and battery-backed populated board.

Underneath your Amiga 500 you'll find a panel; removing this reveals a 56-way connector which is where the expansion board sits. Simply fit the board into place and turn on the machine. It's that easy.

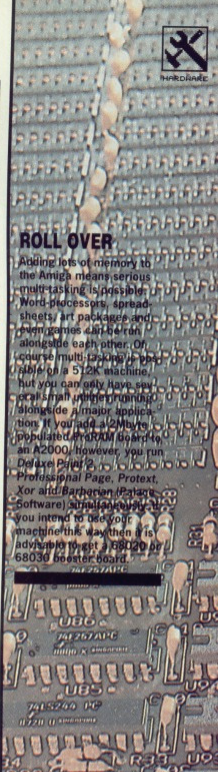
The board is fitted with a switch for turning the extra RAM on or off. A small percentage of games don't work with the extra RAM installed – *Hollywood Strip Poker* for instance – consequently the switch comes in handy for de-installing the additional 512K memory. It is necessary to power off the Amiga before flicking the switch.

Instructions are provided for installing and setting the clock – although this literature is present in the Amiga manual, it is tricky to find and not well explained. Good one, Datel. The board looks well made, comes in various models (to suit individuals' pockets) and is cheaper than Commodore's expansion interface.



■ *Probably the cheapest 512K expansion board for the A500 is Ashcom's little number. (It's the one our hunk on this month's cover is muscling in on.) The board is like most A500 RAM expansions in that it plugs into the port underneath the computer. Ashcom's board costs £99.95 fully populated, but there is no real-time clock option. Details from 10 The Green, Ashby-de-la-Zouch, Leicestershire, LE6 5JU (0530 411485).*

512K EXTENTION	
features	4.5
ease of use	4.0
manuals	3.0
format value	4.0



ROLL OVER

Adding lots of memory to the Amiga means serious multi-tasking is possible. Word-processors, spreadsheets, art packages and even games can be run alongside each other. Of course multi-tasking is possible on a 512K machine, but you can only have small images running alongside a major application. If you add a 2Mbyte unpopulated ProRAM board to an A2000 (however, it can run Deluxe Paint 2, Lattice C Professional Page, Protext, Xor and Barbarian (Psygnosis Software) simultaneously) if you intend to use your machine this way then it is advisable to get a 68020 or 68030 booster board.

DRAM, STATIC AND CHIPS PLEASE

There are two main types of memory chips used by the ST and Amiga machines, 1Mbit DRAMs and 256Kbit DRAMs. 1Mbit-by-1 dynamic RAM chips have 18 pins; eight bits to a byte means you need eight of these chips to provide 1Mbyte of memory. A little maths shows that 32 256Kbit RAM chips will also make up 1Mbyte of memory.

Dynamic RAMs are slower than static RAMS, but consume less power and are cheaper. Early computers like the Commodore PET and TRS80 didn't have much memory and hence used the more expensive static RAM. Today's crop of computers – including the ST and Amiga – use dynamic RAMs. Dynamic RAMs are like capacitors – they lose their contents very quickly unless they are refreshed.

Dynamic RAM chips are available at numerous speeds, meaning how fast a byte can be fetched out of memory. Speed is measured in nanoseconds (billionths of a second); 150ns to 120ns is typical. Faster chips cost more and you don't always get performance improvement when using them. Hunt around before buying RAM chips; prices are so volatile and vary considerably from dealer to dealer. Following is a list of RAM prices from various suppliers and dealers at the time of writing:

SUPPLIER	PHONE	RAM TYPE	PRICE
Amiga Centre	031-557 4242	1Mbit	£24.15.
Commodore*	0628 770088		
Electromail	0536 204555	256Kbit	£5.29
Electromail	0536 204555	1Mbit	£25.92
Maplin	0702 554161	256Kbit	£7.85

*** Yes, Commodore can supply RAM chips. And, yes, there was nobody at Commodore that could come with any further details.**

ST RAM DEALS

For the best internal RAM upgrade deal check with various computer repair shops. For instance, the Trowbridge Workshop (0373 858031) can add 512K to a 520 for £170. Most repair shops won't even consider upgrading a Mega 2 to 4Mbytes. In fact, many recommend that you sell your 520 or Mega 2 and buy a 1040 or Mega 4 – it works out cheaper.

SECOND DRIVES

Early STs came with single sided disk drives which could only store 360K of data, as opposed to the current models which can take 720K on a disk. There is obvious advantage in getting a second 1Mbyte capacity drive, or upgrading the internal drive. File copying and disk copying are much faster with two drives; little software *demands* two drives (Microsoft Write on the ST is one).

If you plan to use an Amiga seriously then you will need a second drive. All uses of the CLI, and simple things like file and disk copying suddenly become bearable. Often applications are written in such a way that data files can only be loaded from a second drive. Many games that come on two disks will similarly benefit from two drives as there won't be any need for disk swapping. It's pointless listing the software that makes use of a second drive because all properly written Amiga programs will gain from two drives.

■ *There is such a wide variety of second drives to choose from for the ST and Amiga that it can be tough deciding which to go for. Datel's second drive (pictured here) costs £89.99 and is available for both machines; it's £60 cheaper than Commodore's and Atari's official model. A twin drive system for the Amiga, modelled closely on the drive shown here, can also be bought from Datel (0782 744707). Price £149.99.*

TRACKER DRIVE

£129.95 ■ All Amigas ■ HB Marketing, HB Marketing, Brooklyn House, 22 The Green, West Drayton, Middx UB7 7PQ (0895 444433)

There's not a lot you can say about a disk drive. They all do the same job. Some are more cosmetically appealing; and this is usually reflected in the price. HB's *Tracker* drive is like most Amiga drives in that it has a lead that plugs into the Amiga's drive port and it gets its power from the computer. Unlike many drives though, it is compact and matches the Amiga's colour scheme perfectly.

What really sets *Tracker* apart from other drives is its two-digit LED track display. The display shows which side of the disk is being read and the track number that the drive head is reading (or writing). Disk side is indicated by a blob while the track number is shown by a number in the range 0 to 85. (See the margin note

ST 512K INTERNAL UPGRADE

Upgrading your 520 to 1Mbyte involves opening the machine, soldering in new RAM and closing everything afterwards. Sounds simple enough, but it needs some skill.

After removing the casing of your 520 you will encounter a nasty metal casing held to the motherboard by screws or metal twists. Half an hour of cursing will have that lot off (*now you know why it's called a motherboard – Ed.*). Located at the front-left of the circuit board you will see the 16 RAM chips which make up 512K. Behind these there is provision for a further 16 chips.

The next step is determined by the the age of your ST; some STs have RAM sockets while others have nothing but solder-filled holes in the circuit board.

Assuming the positions for the extra RAM sockets are filled with solder, get rid of the solder using a solder sucker. The RAM sockets can then be soldered into place. After this, the chips themselves can then be added. Care must be taken that these face the correct way (a the notches on the chips must all be lined up) otherwise they will be destroyed when the power is turned on. The 16 capacitors connect between the two rows of RAMs; their exact locations are made obvious by the markings on the circuit board.

Finally, it may be necessary to add the resistors. In the bank marked R68 to R75 on the board there may be three resistors missing (R71 to R73). These will have to be added if this is the case. Similarly, there may be two sets of resistors – three at 68Ω followed by three at 32Ω – with a third set missing. Fill the missing set with 68Ω resistors.

If you're not up to tackling the job then your local computer repairman will probably do it for a small fee. Some repair shops will even supply the RAM and any other necessary items.

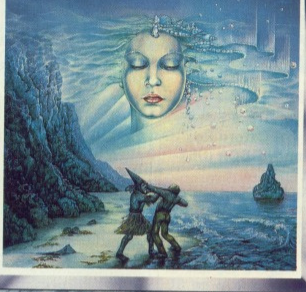
■ *Datel Electronics – Fenton Industrial Estate, Govan Rd, Fenton, Stoke-on-Trent, ST4 2RS (0782 744707) – can supply you with the ST upgrade kit for £99.99. The kit comes with 16 256Kbit RAMs, 16 sockets, 16 100nF capacitors, three 33ohm resistors, three 68ohm resistors and excellent installation instructions. For an extra £9.99 Datel can throw in a soldering iron, solder sucker and solder. These items are essential for doing the job.*

Talespin

BY MARK HEATON

ATARI ST
AMIGA
& IBM

THE INTER-
ACTIVE
PROGRAM
CREATOR



AMIGA CONVERSION BY
TIMOTHY PURVES

WHAT IS IT? Talespin is a package which allows the collecting together of drawings, texts and sounds onto a series of pages together to form an interactive story, guide or textbook, which is read purely by clicking the mouse on the drawings or texts. Variables may be used to control the flow of narrative or record progress made. Talespin itself is entirely mouse-driven and very user-friendly, requiring no programming skills for its use. It includes an art package as well as importing Neochrome, Degas or IFF picture files and also imports ST-Replay or Amiga A.M.A.S. created Digitised Sound. The use of sound is optional. Its facilities include giving full details of disk space usage, location of all pages referring to any particular page, drawing, sound or variable, completely interactive development allowing changes to any part of a title at any time, the copying of drawings and sounds from other titles, the 'chaining' to other titles allowing the spreading of a story or textbook across several disks, and the provision of Demo mode, which allows a title to run on its own for demonstration purposes.

WHAT IS IT FOR? It can be used to create interactive adventure games, for profit, pleasure or instruction. Or in business to create a sales demonstration, or product servicing manual. Or in education: either using Talespin itself to teach the design and logic of computer systems in a non-technical way, or using Talespin as a vehicle for the teaching of any other subject. Or create an expert system with it. Or a school magazine. Or . . .

Talespin is ideal in most applications requiring inter-linked graphics and text and usable by persons with no programming expertise. And it's fun!

IMPORT ANY NEO, DEGAS, IFF PICTURE FILE OR USE TALESPINS OWN BUILT IN ART PACKAGE

ONCE DRAWN A PICTURE CAN BE CHANGED IN HEIGHT, WIDTH & COLOUR AND CAN APPEAR MANY TIMES ON MULTIPLE PAGES

POSITION A CHARACTER BY SIMPLY CLICKING & DRAGGING WITH THE MOUSE

LINK TEXT BOXES TO CHARACTERS AND ALLOW MULTIPLE CHOICES IN THE BOXES

OVER 100 COMMANDS ARE AVAILABLE FROM THE DEVELOPMENT MENUS

SOUNDS CAN BE IMPORTED FROM REPLAY 4 AND THEN REPLAYED AT DIFFERENT SPEEDS AND LINKED »

replay 4

microdeal

·A·M·A·S·

« SOUNDS CAN BE IMPORTED FROM A.M.A.S. AND THEN REPLAYED AT DIFFERENT SPEEDS AND LINKED

CREATE YOUR OWN COMMERCIAL PROGRAMS

Once you've finished developing your program whether it's an adventure, an educational program or other you can lock your program so on one can enter the development mode.

TALESPIN comes with a public domain display program called "Telltale": with this you can distribute your own programs or offer them to pubishers.

COMPLETE AND COMPREHENSIVE MANUAL

The manual comes as a complete Tutorial with a scaled down version of "The Grail" adventure and also a comprehensive reference guide.

ATARI ST
AMIGA
£29.95

TALESPIN COMMAND FACILITIES AVAILABLE

choose/create title ✻ save position ✻ load position ✻ select drive /folder ✻ auto start ✻ demo program ✻ help ✻ drawing define ✻ page define ✻ sound define ✻ variable define ✻ turn to another page ✻ add drawing to page ✻ modify palette ✻ select backround colour ✻ page entry options ✻ list conditions ✻ list/set variables ✻ move drawing ✻ swap colour ✻ shrink/reverse drawing ✻ change drawing order ✻ add/edit/delete text ✻ replace/remove drawing ✻ locate item ✻ show disk space ✻ show drawing/sound-/page size ✻ chain to other title ✻ and more

TRACKMASTER

ST owners envious about the Amiga *Tracker* will be interested in Datel's *Trackmaster*. The unit sits in the ST's external drive socket and has a daisy-chain socket for a second drive. *Trackmaster* has a two-digit display which shows the track number, disk side and read/write status as the head moves along the disk. It can display information on both internal and external drives by means of a switch. £34.99 if you're into flashing lights.

[redacted]

DOUBLE TROUBLE

Double sided drives – like those found in new STs and all Amigas – have two read/write heads. When you slot a disk in the drive there will be a drive head each side of the disk. Head 0 is situated above the disk while head 1 is located underneath.

[redacted]

on disk organisation if you can't see why this should be useful.)

Developers and hackers will love this drive. You will be able to find drives for around £100, but an extra £30 for a few flashing lights isn't too outrageous. Just one complaint: the documentation is in German!

TRACKER	
features	3.5
ease of use	4.5
manuals	0.5
format value	4.0

MINI DRIVE

£84.99 ■ All STs ■ Siren Software, 2-4 Oxford Rd, Manchester, M1 5QA (061-228 1831)

A2000 and A1000 Amigas can power up to three external disk drives before any extra power source is required. Even the A500 can support one external drive on its own. No such luck with the ST though. If you want to attach an external drive to the ST, then the drive must have its own power supply. Because of this, Atari drives are generally more expensive than the Commodore equivalents.

■ *Look no power supply! The Mini drive gets its power from the joystick port. This means you can't play the majority of games while the drive is plugged in.*

Here's one for the books; an ST drive that needs no extra power. It gets all it needs from the computer, but it doesn't do it using conventional techniques. The *Mini* drive gets its power from the joystick port! Whether this is a good idea or not is debatable, but the drive and ST work happily together. The joystick port was never meant to be used as a power source, so there could be a detrimental effect to the machine over a period of time. Siren, naturally, think not.

The *Mini* drive is unquestionable value for money; the cheapest you'll find. What is questionable though, is its effect on the ST.

MINI DRIVE	
features	3.0
ease of use	4.5
manuals	na
format value	4.5

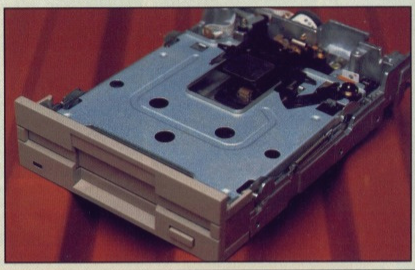
INTERNAL 1MBYTE DRIVE UPGRADE FOR ST

Early 520 STs have a single sided internal drive. The ST operating system can handle the double sided variety, so it makes sense to upgrade as disks formatted with these drives have twice the storage capacity. Single sided disks provide 360K storage while double sided disks manage 720K. Don't get confused by the term '1Mbyte drive'; this indicates the total amount of storage on a double sided disk *before* formatting.

Replacing the internal drive on an ST sounds daunting, but it is far easier than adding extra RAM. The first task is to remove all the screws from the underside of the computer. Turn the computer on its side and remove the bottom half of the case. Lay the machine on a flat surface and locate the disk drive – it's attached to the motherboard by a length of ribbon cable. Unhook the cable from the disk and remove the drive.

Locate the new drive and connect it to the cable just removed from the old disk drive. Replace the casing and the screws, and you now have a 1Mbyte internal disk drive. Easy really.

Datel Electronics (0782 744707) can provide you with an appropriate drive. Cost is £79.99.



OFFICIAL COMMODORE AND ATARI DRIVES

■ ***You may be able to get external drives cheaper from third party manufacturers, but they won't match the styling of your computer. That's the only advantage of getting the official drive; it complements your system rather than sticking out obnoxiously. You pay for prettiness. Commodore's A1010 3.5" drive – styled to sit next to the A1000 rather than the more recent Amigas – costs £149.99. If you prefer to add an internal drive to the A2000, then that too will cost £149.99. Atari's second drive weighs in at £149. It looks good next to any ST.***

FAST UPGRADE FACTS

There are many suppliers of RAM boards and second disk drives for the ST and Amiga. Naturally not all could be reviewed; only the latest models. If you look around you might find better deals than the ones reviewed. Here's a very incomplete list detailing some of what's available:

PRODUCT	PRICE	SUPPLIER	PHONE
Amiga 3.5" drive	£79.97	Ferrotec	0103 531952529
Amiga 3.5" drive	£75	Miracle	0454 317772
A500 Supradrive [1]	lots	Frontier	0423 67140
Amiga 3.5" drive	£85	Power Computing	0234 273000
A2000 internal drive	£70	Power Computing	0234 273000
ST 3.5" drive	£90	Power Computing	0234 273000
Amiga 3.5" drive	£79.95	Evesham	0386 765500
ST 3.5" drive	£82.95	Evesham	0386 765500
512K A500 RAM board [2]	£139	Power Computing	0234 273000
A500/1000 StarBoard2 [3]	£199.95	Oasis Software	01-859 4936
EXP 1000 Amiga board [3]	£193.20	HB Marketing	0895 444433
A1000 Insider[3]	£189.98	HB Marketing	0895 444433

[1] This is a hard drive, but it can have up to 2Mbytes of RAM added to it. If you forget the price of the hard drive, then this is the cheapest method of increasing the A500's memory by 2Mbytes.
[2] Populated and includes battery-backed clock.
[3] Unpopulated.

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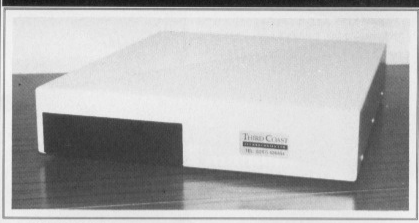

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Atari ST Compatible Hard Drives

22 M-Byte (Formatted)	£399.00
32 M-Byte (Formatted)	£439.00
65 M-Byte (Formatted)	£549.00
130 M-Byte (Formatted)	£799.00
40 M-Byte (Removable)	£749.00
60 M-Byte (Removable)	£899.00

Amiga Drives

20 M-Byte (Formatted)	£550.00
30 M-Byte (Formatted)	£599.00
60 M-Byte (Formatted)	£699.00
2 M-Byte Ram module A500 I/Face	£550.00

Third Coast DIY Kits (Everything to build your own Drive)

DMA/SCSI Host Boards	£89.00
Twin Drive RLL Adaptec 4070 or Omti 3527 controllers (giving 50% more out of any drive + twice the speed)	£96.00
Astec 65 watt PSU's	£39.00
Everything as above including fan, Astec - everything bar drive)	£299.00
Amiga interface boards	£199.00

Third Coast Drive Upgrades

Upgrade your Atari SH204/5 Megafile 20/30, Supra, Cumana or Triangle drives)
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PACK G	Amiga A500 + Mouse + Modulator + A1010 Disc Drive + Aegis Sonix + Our Special Pack (20 Disks)	**£548.99**
A2000	+ Mouse + 1Mg RAM + Our Special Pack (20 Disks)	**£1399.99**
A2000	+ Mouse + 1Mg RAM + A1084 Colour Monitor + Our Special Pack (20 Disks)	**£1699.99**
A2000	+ Mouse + 1Mg RAM + A1084 Colour Monitor + BridgeCard + 20 Meg Hard Disk + Pocket Colour T.V. + Our FREE Special Pack (20 Disks)	**£2529.99**

ATARI 520STFM/1040STFM

PACK A	520STFM + 1 Meg Disk Drive + BASIC + Our FREE Special Pack (20 Disks) + Books	**£299.99**
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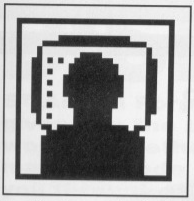


GOLD DUST

STEVE GOLD, stateside supermole, reports on ST and Amiga developments occurring the other side of the great puddle. More upheavals in the Commodore hierarchy, Atari prospects at Hannover, DNIC loophole closed and news of new Mac emulators.

There's a spot of mixed news for UK users of Compuserve, the giant online database in the US. As of 31 January this year, links between non-US X.25 networks and the Compuserve network in the US have improved, with faster response times available from Europe. The downside of the upgrade is that international subscribers are now charged at the correct tariffs.

Previously, international subscribers accessing Compuserve using the Destination Network Identity Code (DNIC) of A9-3132 were charged at the default 300 baud rate of $6 an hour. Today, subscribers accessing at 1200 and 2400 baud must now pay the full rate of £12·50 per hour.

All change

It's been a busy month on the Commodore front. In the US, nearly two years after the departure of Thomas Rattigan, a new man – Mehdi Ali – has been appointed as president of Commodore International.

Ali has been in the background at Commodore US for some months, acting as a consultant to the company, and generally assisting Irving Gould, Commodore's top dog. A minor shake-up at Commodore Europe occurred in parallel with Ali's appointment: Harold Speyer, the joint European manager with Christian Anderson, abruptly left the company. According to Anderson, who effectively becomes general manager of Commodore Europe Limited (CEL), Speyer's departure was amicable, and he will continue to assist the company on a consultancy basis.

This places Christian Anderson in a position of considerable power, with Steve Franklin and the rest of Commodore UK effectively reporting to him for day to day decisions on the management of Commodore UK. Shortly after Speyer's departure, Anderson told me that titles within CEL are for formal purposes only. This relaxed attitude to management is invigorating, and indicates that Commodore UK has a great future ahead of it.

Not Hannover

All eyes are on Atari and what 'Big Jack' has lined up for the Hannover Fair in March. My sources tell me that Atari is planning to show, but not announce firm pricing and delivery dates, of its much-touted 68030-based machines.

Reportedly, the machine is running (as of mid-February) and comes in a PC-AT style cabinet. Engineers at Atari's Sunnyvale, California, headquarters have managed to get Unix v5.3 and TOS version 1.4 up and running on the machine.

Back in the US, meanwhile, and the Michigan Atari Computer Enthusiasts (MACE) have been getting fed up with the lack of US shows at which Atari goodies are available. So fed up, in fact, that they've planned their own show – the Michigan Atari Computer Exposition (MACE).

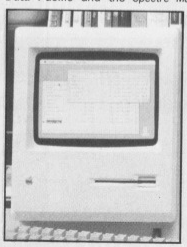
MACE's MACE will be held at the Detroit Metro Airport Hilton on the 6th and 7th of May, 1989. The show promises to be worth a visit if you're in the US around this period. According to Pattie Rayl, the convetion coordinator, more than 40 stands have been booked by developers, retailers and dealers, all of whom plan to make the show worth travelling to from all over the US.

If you're planning to be in the US for show, give Pattie a call on 0101-313 9738825. She has negotiated a 40 per cent discount with Northwestern Airlines for show-goers, as well as a $55 a night rate at local hotels – not bad, when the standard rate is $127 a night. Further details of the convention can also be obtained by writing to: The Michigan Atari Computer Expo, MACE, 3487 Bradley Circle, Ann Arbour, MI48108, United States.

■ *Scheduled for a Hannover roll-out (with a US launch in parallel) is an update of Wordperfect 4.1 for the ST. Sources originally indicated that Wordperfect US were ceasing ST-only development of the package. This still holds true, but the improvements stem from work on other versions. Wordperfect 4.2, as the new version has been dubbed, will ship during April in the US and Europe. Enhancements shown to developers and programmers to date include allowing the TOS 1.4 item selectors to be used.*

MORE APPLE MAC EMULATORS ON THE WAY

On a slightly different topic, regular readers of this column will probably be familiar with the existence of an Apple Mac emulator for the Atari ST. Well, how about one for the Amiga? True, Dave Small of Data Pacific and the *Spectre Mac* emulation cartridge for the Atari ST is working an ST/Amiga/Mac tri-machine emulator called *Hyperweb*, but this project is still some way off from completion.



Another company, Readysoft, may pip Small to the post on the Amiga front since it should have a unit called *AMAX* available. *AMAX* is a software/hardware combination that allows Mac and Mac Plus software to be run on any Amiga. AMAX plugs into the external disk drive port on the Amiga via a supplied cable.

As with Dave Small's Mac emulators for the ST, you'll need to find a source of Mac 64K or Mac Plus 128K ROMs for the *AMAX*. You'll need a Mac 800K external drive to be able to load Mac/Mac Plus software; AMAX can quite happily take an external Amiga drive on its pass-through expansion slot.

According to the Unpaid Amigan online newsletter (available on several US BBSs), alpha test versions of *AMAX* work well using an interlaced of 640 by 400 pixel mode. Most Mac functions – in monochrome, remember – will run under *AMAX*, including the parallel and serial ports. The Unpaid Amigan reports that you can even hook up an Apple Laserwriter II or Laserwriter laser printer to the Amiga with excellent results (does John Sculley know about this? –Ed).

Version 1.0 of *AMAX* should be out in the US at around $150 by the time you read this. The bad news is that hard disk, multi-tasking and Appletalk networking support has yet to be implemented. Upgrades will be available at free or nominal cost, however.

SIREN SOFTWARE

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DISK EXTRA

ST Amiga Format's unique dual format disk gives you the best of both ST and Amiga worlds! Whether you're a joystick jockey or a machine code maniac, JASON HOLBORN takes you through the months goodies.

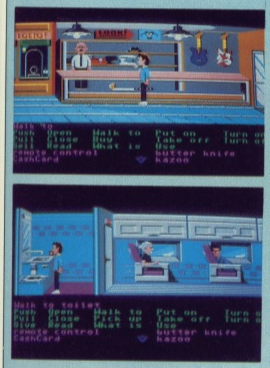
DISK

ST

New to the ST? See page 40 for full loading details

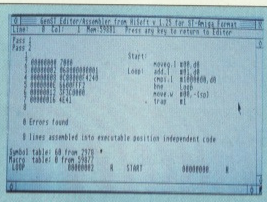
34 ZAK MCKRACKEN

If you thought the Sunday Sport was bad, discover the truth about journalists with Lucasfilm's zany expose of the exploits of a Fleet Street loser. Don't just read the review, enjoy the demo and then try it for yourself.



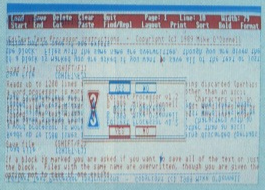
35 DEVPAC

So you want to learn Assembly language programming then, eh? Beginning this issue is *Format*'s oh-so-easy tutorial, and here's all the software you need. HiSoft, bring you the king of all assemblers, the ever popular *DevPac*.



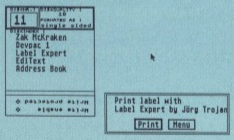
36 EDITEXT

Everyone needs a text editor; programmers, writers, even you! *Editext* is a fast and powerful editor that can be used to produce anything from a get-well-soon letter to your Mother-in-law, to the program code of your latest mega game.



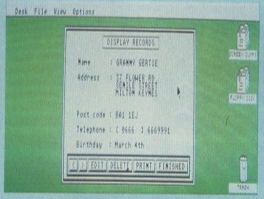
36 LABEL EXPERT

Is your disk collection getting out of hand? How about your video tape collection? You need to get organised, matey, and we've got just the program. With *Label Expert* and a printer, you can have wonderful labels in a matter of seconds.



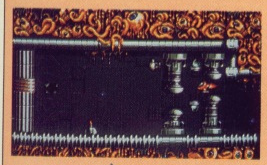
38 ADDRESS BOOK

Do you fancy yourself as bit of a yuppie? With this handy address book, you can keep track of all the best wine bars, *filoFax* stockists and even your local portable telephone engineers.



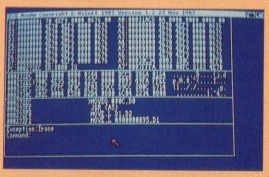
AMIGA

New to the Amiga? See page 40 for full loading details



34 CYBERNOID 2 DEMO

Get your hands dirty on the complete first level of Hewson's latest blockbuster game, *Cybernoid 2*. Fast action, compelling gameplay, superlative effects, they're all there in this multi-level mega game.



37 DEVPAC

Of course our Assembler tutorial isn't just for ST owners heres the Amiga version of HiSofts *DevPac*. Join the likes of Jez San, a fellow user of *Devpac*, and get into true power computing with this amazing machine code development system.

38 PRINTEXT

Have you ever found a stray text file floating around on a disk but you just can't figure out how to read it? With *PrinText*, youll never again be left in the dark as those wondrous words of wisdom will be yours for the taking.

WIN £800 see page 40

DISK

ZAK: THE FULL VERSION

Does life as a tabloid reporter working for the gutter press appeal to you? If so then you'll be pleased to know that the full version of Zak McKracken is available for only £24.95. Read our review in the Screenplay section this month.

CYBERNOID: THE FULL VERSION

Impressed by our mega demo? You'd be hard pushed not to be! You can buy the full game for only £24.95, or even less from our special offer pages. Go get it... you won't be disappointed!

ST

ZAK MCKRACKEN

PROGRAM: By Lucasfilm/US Gold
MACHINE: All Colour STs
FILES: ZAK.PRG, ROOMS Folder

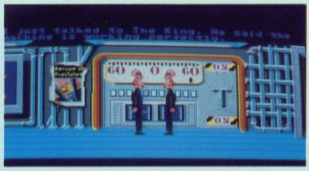
For Zak McKracken, it's just another day at the office. He's the roving reporter who's scoffed at by his peers, dreaded by his creditors and relished by readers of his tabloid sleaze. Zak is just the kind of guy you'd expect to find walking down Wapping way, camera loaded and at the ready, just waiting to catch somebody famous doing something that perhaps they shouldn't be doing and then returning to his office typewriter to blow the story totally out of proportion.

But one night in bed, Zak McKracken uncovers evidence of an extraterrestrial plot and unlike all the other alien conspiracies that his tabloid churns out with regularity, this one is for real!

You can join Zak on his quest to thwart the alien invaders with this months mega game demo. The copy on our cover disk is a demo in which Zak will give you a guided tour around his zany world. Play *Zak McKraken (and the Alien Mindbenders)* and the Sunday Sport will seem almost tame in comparison!

What is two-headed squirrel
Push Open Walk to Put on Turn on
Pull Close Pick up Take off Turn off
Give Read What is Use
remote control butter knife
CashCard kazoo

■ *Zak wonders aimlessly in the wilderness.*



■ *Just look at these strange chappies!*

Getting Going

You can enter the world of Zak McKraken by double clicking on the ZAK.PRG icon on the Desktop. Don't worry if the demo seems to take a long time to load; there's quite abit of data being pulled in from disk!

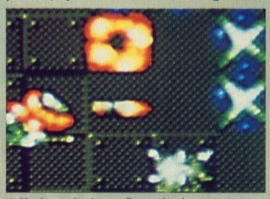
AMIGA

CYBERNOID 2

PROGRAM: By Hewson
MACHINE: All Amigas

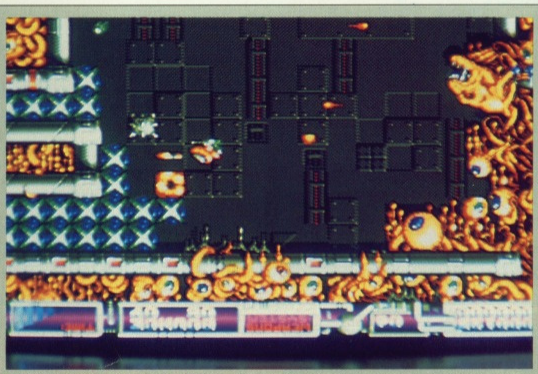
FILES: Cybernoid2

I'm a hardened gamer, I've seen them all and played them all... no game gets past my joystick! So, you think you've seen the very last word in games, do you? Not until you've played Hewson's latest mega block buster *Cybernoid 2* you haven't!



■ *You're under heavy fire and unless you move quick, you're going to be history pal!*

Cybernoid 2 is, not surprisingly, the follow up to Hewson's mega successful cult classic, *Cybernoid*. Version 2 has already gone down a treat with 8-bit owners and it has been receiving rave reviews from top games magazines such as *Format*. With a recommendation like that, how can you go wrong? Still not convinced? Why not see for yourself why it is causing such a stir in the games world by playing our exclusive demo.



■ *Look at the state of that wall paper!*

The plot behind *Cybernoid 2* has you up against a motley crew of space pirates that return to wreak their terrible revenge after you banished them to enternal torment in space. Several minerals that are vital to the survival of your planet have been stolen by the space pirates and its up to you to retrieve the oh-so vital minerals.

Getting Going

You can load this amazing playable demo by either clicking on the *Cybernoid 2* icon on the Workbench, or by inserting your cover disk at the Insert Workbench screen when you first turn on, in which case the demo will automatically load. During loading, the screen will flash wildly and do all manner of strange things, but don't worry, your machine isn't doing the dying fly; this is just Hewson's oh-so-clever loading system doing its stuff!

To play the game, you'll need a joystick plugged into joystick port 2 and then just press the fire button to start play. To access extra weapons, just press the function keys.

STand AMIGA

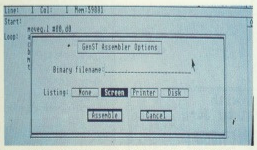
DEVPAC

PROGRAM: by HiSoft
MACHINE: All STs and Amigas
FILES (AMIGA): GenAM, MonAM, DEVPAC.DOC
FILES (ST): GENAM.PRG, MONAM.PRG, MONAM.TOS, MONAM.RSC, DEVPAC.DOC

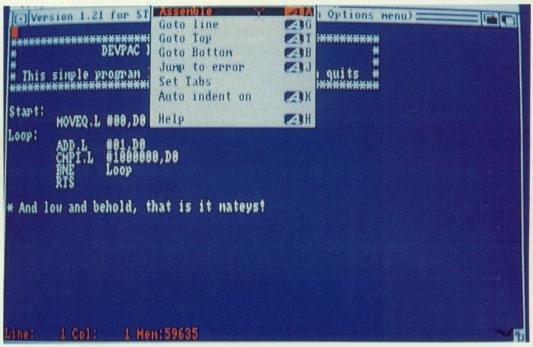
If there is one subject that's bound to start an argument among a group of programmers it must surely be the old chestnut, Which is the best programming language? Some argue strongly for the merits of C, others witter on about how wonderful Modula 2 is and occasionally theres the odd mention of such languages as COBOL and FORTH. But look carefully and among that group you'll often find an individual sat quietly in the corner watching on and quietly smiling to themselves; you've just spotted the assembler programmer! (*Yup, they're stoned out of their minds Ed*).

No matter how hard other languages may try, there is just nothing that can touch assembly language in terms of speed and power. When you write a program in assembler, you are writing it in the fastest language available. Unfortunately it can be a difficult language for beginners to understand, but once grasped, you'll never look back!

This month sees the start of a great new programming series that aims to teach you how to write programs in this powerful language and to give you the ideal start *Format* and HiSoft have joined forces to bring you the *complete* version of HiSoft *Devpac 1*. The only omissions from our cover disk version are the commercial version are that you don't get a manual in a rather posh ring binder; just a jolly little text file.



■ *The Devpac assembly dialog box. Enter the output filename and the destination for the assembly listing and you're away.*



■ *The GenAM editor in action. Just select ASSEMBLE from the pull down menus and your program will be assembled into super fast machine code.*

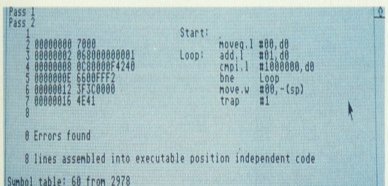
Getting going with Devpac

The Devpac development system comes in two parts; the GenAM/ST editor/assembler and the MonAM/ST monitor/debugger. You can load the *DevPac* assembler by clicking directly on either the GenAM or GenST icons, depending on which machine you have. Brief instructions are available within the Devpac folder; these should be adequate to get you churning out your programming masterpieces at a rate of knots.

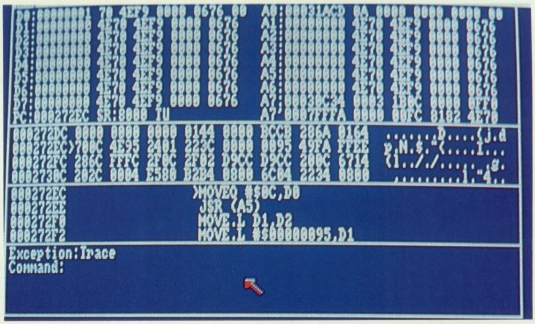
Writing a machine code program will require you to use at least one, and most probably both of the two Devpac tools. In GenAM/ST you will first enter your code and then assemble it to disk. To test your program, you would then exit GenAM/ST and then run the program directly. If (or should that be when!) your program fails to work properly, you would then load it into the Devpac Monitor/debugger, MonAM/ST. Full instructions on the complete use of *Devpac*, including a sample tutorial are included within the Devpac folder. This is most definitely recommended reading if you wish to get the most from this amazing program.

If our cover disk program has whetted your appetite and you'd like to get your hands on the complete documentation, then for only £25 you can get the absolute 100% complete package, including a manual in a rather attractive ring binder. See this months Special Offer pages for details.

Of course, for the more advanced users among you, HiSoft also poroduce an upgraded system in the form of *Devpac version 2* for only £59.95. *Devpac version 2* features an integrated edit-assemble-debug environment.



■ *GenST assembling a simple program. In a matter of seconds, your source code is turned into ready to run machine code. By selecting the screen as the output channel for the assembly listing, you can see your assembler program displayed next to its machine code equivelent.*



■ *Is your program going out to lunch with the Guru or bombing the Desktop? Load it into the Devpac debugger, and you can say goodbye to those bugs.*

ST

EDITEXT

PROGRAM:
By M. O'Donnell
MACHINE:
All Colour STs
FILES: EDITEXT.PRG, EDITEXT.DOC,

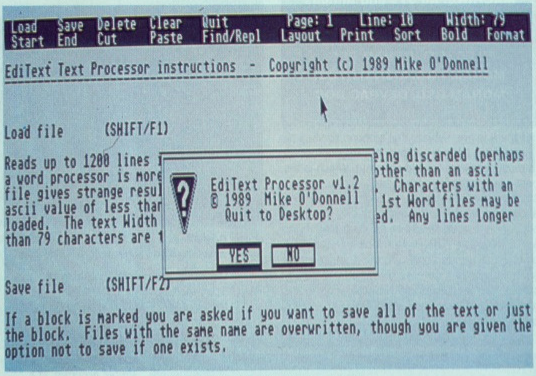
Every now and then, we at *Format* publish a program on the cover disk that requires you to create or edit a text file; the *Hangman* and *Message Writer* programs from a couple of issues back are examples. How do you do this if you haven't got one of those expensive word processors? answer: you can't!

EdiText is a comprehensive text editor that includes many useful features that you've come to expect from a machine as powerful as the ST. Even though *EdiText* does flaunt some powerful functions such as extensive block manipulation facilities, speed is not sacrificed, as is usually the case, and you can dart around your text file at considerable speed. *EdiText* is also beautifully easy to use so youll be up and running in no time.

All the functions in *EdiText* are accessible from the function keys in a similar fashion to that made famous by the excellent editor provided with GFA BASIC. As with all programs of this type, experimentation is the best way of getting to grips with it.

Getting Going

You can load *EdiText* by double clicking on the EDITEXT.PRG icon on the Desktop. Full instructions are available in the *EdiText* folder. Why not try loading the documentation file into *EdiText* as your first step with this excellent program!. To load the instruction file, select LOAD by pressing [SHIFT] + [f1], and then when the GEM file requester pops up, select the file, EDITEXT.DOC and click on LOAD.


Load Save Delete Clear Quit Page: 1 Line: 10 Width: 79
Start End Cut Paste Find/Repl Layout Print Sort Bold Format
EdiText Text Processor instructions - Copyright (c) 1989 Mike O'Donnell
Load file (SHIFT/F1)
Reads up to 1200 lines
a word processor is more
file gives strange resul
ascii value of less than
loaded. The text Width
than 79 characters are
ing discarded (perhaps
other than an ascii
. Characters with an
1st Word files may be
ed. Any lines longer
EdiText Processor v1.2
© 1989 Mike O'Donnell
Quit to Desktop?
YES
NO
Save file (SHIFT/F2)
If a block is marked you are asked if you want to save all of the text or just the block. Files with the same name are overwritten, though you are given the option not to save if one exists.

■ **EdiText** *in action. Here, the* **EdiText** *instruction file is being edited.*

ST

LABEL EXPERT

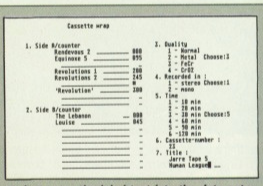
PROGRAM:
Public Domain
MACHINE:
Mono STs only
FILES: EXPERT.PRG, EXPERT.DOC

Calling all mono ST users! This months *Format* cover disk has another extra special program just for you hi-resolution junkies. Who needs multi-plane, full beef parallax scrolling when youve got a monitor that is so easy on the eyes. Forget your 512 colours, give me beautiful mono any day!

Everywhere you go these days, there is always someone trying to get you organised. You walk down the high street and a salesman offers you a *filoFax*, you step into a shop and the shop assistant waves a portable computer in your face and then you buy *Format* and even we are trying to give you address book programs. Now our latest offering: a program to get your disk collection organised. Enter the *Label Expert*.

Label Expert is a powerful program that will allow you to produce a vast array of different labels and then have the results printed on a standard 9-pin dot matrix printer. You can create labels for floppy disks of all sizes, video cassettes in both VHS and BETA format and other miscellaneous items that are in dire need of getting organised.

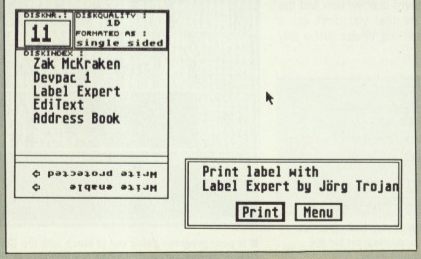
When *Label Expert* first loads, the first thing you must do is choose the type of label you wish to produce. This is acheived through two pull down menus. The first menu is for the more common labels that you are likely to require and the second contains more specialist sizes. Once you've chosen the label type, a data entry screen will pop up which allows you to enter all the text that will appear on the label. For example, if you are producing a disk label, then you would enter the disk number, titles of programs on the disk and whether the disk is single or double sided. Once all the data is entered, the resulting label will be displayed on the screen and you will be asked if you want the label printed... and that's it. What could be easier?



■ ***Just enter the label text into the data entry screen and Label Expert will do the rest.***

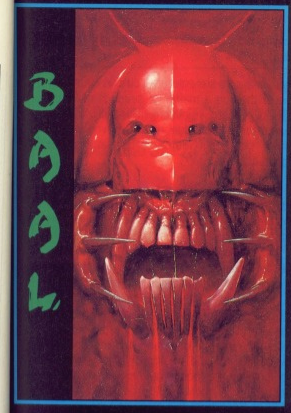
Getting Going

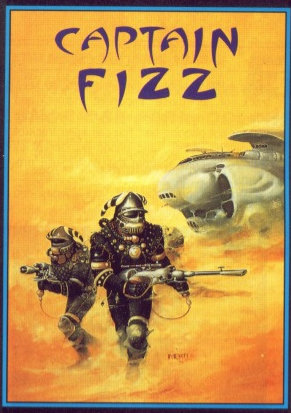
You can load *Label Expert* by either clicking on its icon on the Desktop. Instructions are available within the *Label Expert* folder although we're sure you'll agree, you don't really need instructions for a program that is as easy to use as this.

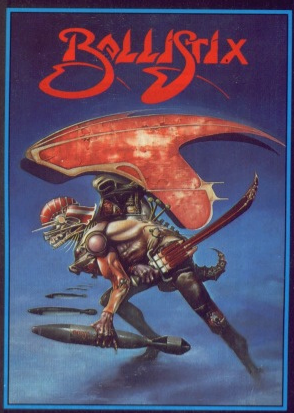


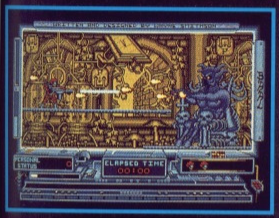
■ ***The finished label in all its glory. All that now remains to do is to print it, cut it out and then stick it onto the object you wish to badge.***

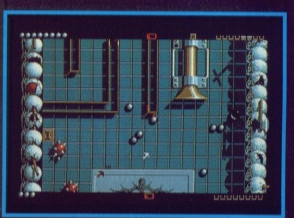
If you have problems sticking the labels onto disks, we recommend the 3M spray mount for paper which will do the job wonderfully!











BAAL

- ★ An addictive mixture of strategy and arcade action featuring:
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The future of the world lies in the hands of an elite squadron of men. YOU are the leader of the Time Warriors. Can you save the earth from the evil BAAL?

His army of undead have stolen an awesome weapon of destruction, a War Machine.

As leader of the ultimate battle fighters, your quest is to invade BAAL's domain, fighting off his monstrous demonic beasts to retrieve the War Machine . . . but . . . you must kill BAAL in the process.

Can you succeed? There is no option . . . the alternative is literally 'Hell on Earth'.

Screen Shots from the Atari ST version

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CAPTAIN FIZZ
Meets The Blaster-Trons

The message is simple: co-operate or die!

It's double fun and double trouble all the way in Captain Fizz, the most exciting simultaneous two-player game you and a friend are ever likely to play. It's a whole new world of split-screen, high-speed action, as both of you take on the nasty Blaster-Trons infesting the planet Icarus.

Yup, it's a tough mission alright, but you might just win out with the right blend of co-operation, courage, laser-hot reflexes, tactical sense. . . and brains. The action is fast and furious in Captain Fizz, but if you can't work out the right tactics you'll both be dead meat.

There are 22 levels of savage and relentless action to battle through before you reach your objective, the central computer that's causing the evil infestation. You'll never get there, though, unless you put your heads together and co-operate; your buddy can't do it on his own, and neither can you. This is one program where even the easy games are hard. So remember — united you stand, but divided you fall. . .

Warning: this game is impossible to beat on your own.

Two joysticks required for two-player game.

Screen shots taken from the Atari ST version

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BALLISTIX
Its a whole new ball game!

Sick of silly old soccer ? Tired of pathetic pinball? Then you need a dose of *Ballistix* - the fastest, wackiest, toughest ball game yet to appear on a computer. *Ballistix* just explodes with excitement, puzzles and an amazing **130 different screens** of frenetic action.

The aim of the game is simple; score more goals than your opponent to win the match. Doing it is a different matter as **splitters** fill the screen with dozens of balls, **tunnels** hide them from view, **bumpers** bounce balls all over the show, fiendish **red arrows** speed them up to almost impossible velocity, **magnets** pull them away from your control, and much, much more.

Ballistix is incredibly flexible, too. You can play against the computer or another player, set the speed if you can't stand the pace, define where the balls are fired and their velocity, rack up bonuses that will get you extra goals and then, at the end of an exhausting game, set your name in pride of place on the high-score table. And it's all played to the accompaniment of a throbbing sound-track and a crowd that applauds your every goal.

Ballistix is definitely not a game for wimps. It's tough, fast, challenging and incredibly competitive - in fact, it's just the kind of game you like.

Two joysticks required for two-player game

Screen Shots are from the Amiga version

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PSYCLAPSE

ST

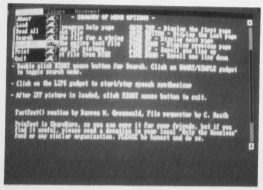
ADDRESS BOOK

PROGRAM:
By P. Houlgreave
MACHINE:
All Colour STs
FILES: ADDRESS.ACC, ADDRESS.DOC

Get Organised! That's the buzzphrase of the 1980s. Everyone, from school teachers to lawyers, from computer users to armadillo breeders are jumping on the *filoFax*-clone bandwagon as more and more companies promise you an instant solution to the age old problem of *baddus memorius* (that's forgetting things, in case you arent a fluent Latin speaker).

Address Book is, not surprisingly, an electronic address book that will allow you to keep track of all those important names and addresses; never again will Aunty Gertie nag you for not phoning her! You can keep track of the name, address and phone number of all your acquaintances from this easy-to-use program.

Once all the details of your friends and acquaintances are entered, you can locate any one of them in a matter of seconds using the extensive search functions available. You can search for an individual name of even view all names that begin with a certain letter of the alphabet.



■ *Address book in action. Not quite a filofax but then, you can't play* Populous *on one of those!*

Getting Going

Address Book is a Desktop Accessory and cannot therefore be run by double clicking on its icon on the Desktop.

To use *Address Book*, you must first copy the file, ADDRESS.ACC, and all its associated files (listed in the title box) to the top directory of your boot disk by dragging their icons across onto the floppy disk B icon. Once all the files are copied, reset your ST with your boot disk in the internal drive and *Address Book* will be loaded into the Desktop. To run *Address Book*, move the mouse pointer up to the Desk menu and a menu will drop down. Select Address Book from this menu and the program will load. Full instructions on how to get the most from this excellent program are included within the Address Book folder.

AMIGA

PRINTEXT

PROGRAM:
Public Domain
MACHINE:
All Amigas
FILES: PrinText

Have you ever got hold of some Public Domain software and been told to read the README file, only to find you can't see any such file on the disk? Frustrating, isn't it? Usually, the file will be there, but the programmer hasn't bothered to define an icon for it so you just can't see it from the Workbench. Unless youre adept at handling the CLI, youre stuck. Until now.

■ *Just look at all those features! You can print the text file and even display a standard IFF picture.*

PrinText is a very handy text file viewing program that will allow you to uncover the contents of those elusive rogue text files. *PrinText* works in a similar way to a standard Word Processor or text editor as it allows you to move through the file with ease with the mere click of a menu.

A further advantage of *PrinText* is that it will also allow you to view standard IFF picture files with ease; how many Word Processors and Text editors allow that?

Getting Going

You can load *PrinText* by double clicking on the PrinText icon on the Workbench. When *PrinText* first loads it will bring up a file requester asking you for the file to be viewed. If you select the file you require and then click on LOAD, your mysterious text file will be displayed in all its glory. Because of disk space constraints, the instruction file is printed above.

PRINTEXT VERSION 1.5

PrinText is a text viewing program you can use to easily read program documentation, program listings, and any kind of ASCII text files.

SUMMARY OF MENU OPTIONS

ABOUT	**Displays program help page**	**GOTO TOP**	**Display the first page**
LOAD	**Load a text file**	**GOTO BOTTOM**	**Display the Last page**
SEARCH	**Search the file for a string**	**PAGE UP**	**Display next page**
READ ALL	**Read the entire text file**	**PAGE DOWN**	**Display previous page**
LOAD IFF	**Load any IFF picture**	**LINE UP**	**Scroll one line up**
PRINT	**Print text file from Disk**	**LINE DOWN**	**Scroll one line down**

Double click RIGHT mouse button for Search. Click on SMART/SIMPLE gadgetto toggle search mode.

Click on the LIPS gadget to start/stop speech synthesiser

After IFF picture is loaded, click RIGHT mouse button to exit.

FastText() routine by Darren M. Greenwald, File requester by C. Heath

PrinText is ShareWare, so you can copy it for your friends, but if you find it useful, please send a donation to your local Help the Homeless fund or any similar organization. PLEASE be honest and do so.

Any comments, bug reports, or ideas are welcome.

My Address is: Opher D. Kahane
30 Gilboa St
Alfe Menashe, 48851 ISRAEL

HAVING TROUBLE WITH THE DISK?

We have done our best to insure that the programs supplied on this month's disk are simple to use, error free and have no known viruses. However, we cannot answer telephone queries on using the software, and we do not accept liability for any consequences of the using the programs.

If your ST Amiga Format disk is faulty - and out of tens of thousands duplicated some are unfortunately bound to be - you should send it back for a free replacement to:

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HOW TO USE THIS DISK

The *ST Amiga Format* cover disk is a special format disk which both the ST and the Amiga can read. Even if you are a seasoned computer user, please read these instructions carefully or you could permanently damage your copy of it.

The first thing you must do is make a back-up copy of the disk. Because of the special format, the normal disk-to-disk copying methods, as recommended in the Amiga and ST manuals, won't work. Instead you will need to format a blank disk and copy the files individually. Don't panic, this isn't at all difficult.

ON THE ST (assuming a single drive machine)
1. Take a blank disk and format it in the usual way.
2. With the blank disk still in the drive, double click on the A: drive icon to open up the (blank) contents window.
3. Now drag the icon for drive B: into the open window of disk A. This will copy all the files one by one off the master disk to your new disk. *Make sure that the master* ST Amiga Format disk is write protected (the sliding tab should be back so the hole is open) and put it in the disk drive when asked for disk B.
4. You will now be prompted at various times to insert disk A and disk B while copying takes place. There will be a lot of swapping to do on a single drive ST! Disk B should be the master disk, disk A your newly formatted copy.

If you want to cut down on disk swaps, you can use the Eternal RAM disk program provided on issue 5's disk as an intermediate step.

Note that our special cover disk contains about 30K more files than will fit on a standard single-sided ST disk. If you own an old 520, you'll have to be selective and copy only the files you want.

ON THE AMIGA (assuming a single drive A500)
1. Start your Amiga up with your normal Workbench boot disk.
2. Take a blank disk and initialize it in the usual way.
3. *Make sure that the master* ST Amiga Format *disk is write protected* and put it in the disk drive. Double-click on the disk icon that appears. Drag any icons you see in the contents window onto the 'RAM disk' icon.
4. When the disk activity light has gone out, put your newly formatted copy disk in the drive instead. Double-click on the RAM drive icon to open its window, and drag program icons from that onto the new disk icon. This copies the files one by one.

The programs may not all fit in the RAM drive at once on an A500 – do whatever will fit, then after step 3 delete them from the RAM disk by clicking once on each and, holding the right mouse button down, selecting discard from the Workbench menu. Repeat steps 2 and 3 for the rest of the icons.

USING THE PROGRAMS

ON THE ST

When you turn the ST on and put your disk in the drive, you will see a window opened with the contents of the disk displayed.

Each program will have a number of files on the disk. A program called DOUGAL, for instance, will either have an icon named DOUGAL.PRG or there will be a folder called DOUGAL. If there is a folder, double-click the left mouse button on it to open it up, and you should see DOUGAL.PRG inside it. Just double-click on a program's .PRG file to run it.

Each program should have a corresponding .DOC file – double-click on this and then choose 'Show' from the box that appears to read the detailed info from the author. Always read the documentation before running the program.

Programs described as 'desk accessories' don't have .PRG icons to be clicked on – in this case special running instructions are given with the program descriptions.

ON THE AMIGA

The main program will automatically run when you turn on your Amiga and insert the cover disk. To get at the rest of the items, you will need to run up Workbench first of all from your normal start-up disk. Once at the Workbench, put the *ST Amiga Format* disk in the drive and double-click on its icon to open it.

Most programs on this month's cover disk have icons assigned to them. To run any of the programs, just double click on the programs icon and after a few seconds disk access, the program should load ok. In the case of Devpac, when you try to load either GenAM or GenST, the Amiga will prompt you to insert your Workbench disk a couple of times; follow the onscreen requesters and the Devpac programs should load fine. For further instructions on using the Workbench, refer to the Introduction to the Amiga manual that came with your machine.

When you click on a documentation file, a new window is opened and the text is displayed a screenful at a time. Press any key to move from one screenful to the next, or click on the close gadget in the top left-hand corner of the window to cancel the display.

Jason Holborn

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For ❑ ST ❑ Amiga

Approximate total size of files in kilobytes.....K
(we cannot use programs longer than 200K; shorter submissions, under 100K, stand the best chance of publication)
It is a:

- ❑ Game
- ❑ Technical tool
- ❑ Business utility
- ❑ Art program
- ❑ Music program
- ❑ Educational
- ❑ Novelty
- ❑ Other.....

BRIEF DESCRIPTION .....

.....

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Checklist (please tick):

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- ❑ Printout of README.DOC file (if possible)
- ❑ Name, address, machine type written on label
- ❑ Disk certified virus free

IMPORTANT – Please sign this declaration:

This program is submitted for publication by ST Amiga Format *magazine. It is my own work and has not been submitted for publication elsewhere. I claim my national fame and glory.*

Signed .....
Date...../...../.....

If you've got any programs for either ST or Amiga which you think other readers would find useful, interesting or amusing, we'd like to know
1. Make sure your program is foolproof to use.
2. Create a file called README.DOC on the disk which explains exactly how to use your program.
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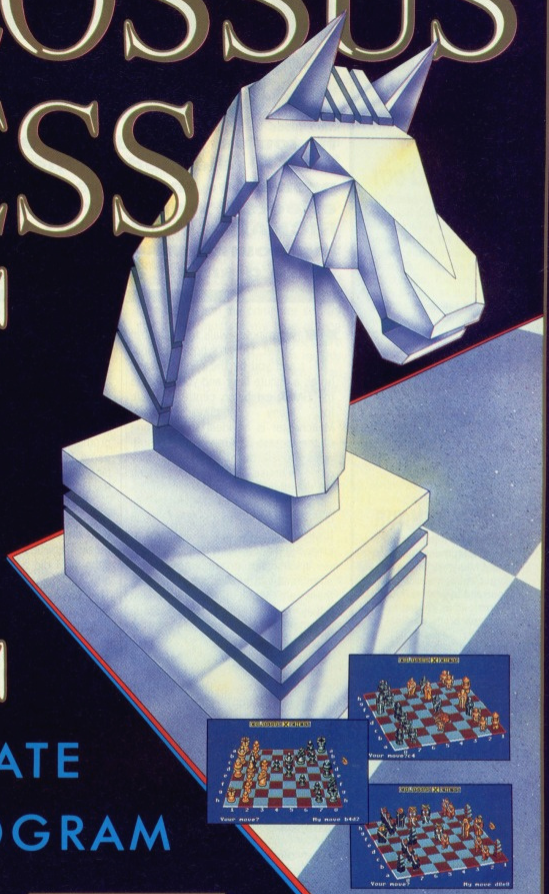

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The Amiga will be available early April 1989 same price as the ST.

MUSIC

DUNN TO BUSINESS

If you've played any Ocean game – on any format – released in the last 18 months then it's probable that the game's music and sound effects were created by Jonathan Dunn. RICHARD MONTEIRO interviews the man making sound waves for the Manchester-based software giants.

Two minutes walk from Central Street, Ocean's home ground, and you hit the plush Midland hotel; a minute later and you're inside the GMEX exhibition centre – venue for many computer shows. Manchester is an ideal spot for one of the largest and most prolific software houses, but the country's many other in-house programming teams will doubtless argue that.

It is claimed that 300 bodies lie close (too close) to the lofty Ocean towers; working late while listening to Enya is definitely not recommended.

Inside the programmer's den, affectionately (?) called the dungeons, there are loads of corridors and pokey rooms. There's the arcade alley, the 68000 section and the music room among others.

It's the music room that we're most interested in as that is computer musician Jonathan Dunn's pad. On many games you'll find him in the credits as The Dunn (as opposed to Not Dunn – programmers have a strange sense of humour). Jonathan, 20, has been with Ocean for the past 18 months. In that time he has written music and sound effects for an incredible number of games. Here's the man and his story.

What did you do before arriving at Ocean?

Originally I worked at home playing with my keyboard; it was, and still is, an obsessive hobby. At the time I had a Commodore 64 and became interested in its sound potential. I managed to get some freelance work writing computer music. There was promise of lots more. In fact, the only game I wrote music for before settling at Ocean was *Subterrania* for Rackit (Hewson's budget label).

I've been writing music for four or five years – not always for computers and not always professionally. My music abilities are self taught, although I did a 'Performance Music and Technology' course at college. That basically covered music recording and recording studios. Originally that's what I wanted to do.

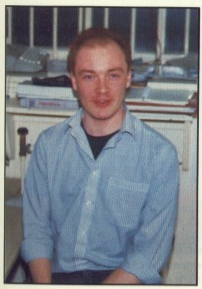
■ *Jonathan Dunn, Ocean's man of music*

You have written music for an impressive number of games and also for a demo tape with the recently-released *Daley Thompson's Olympic Challenge* – can you estimate how many tunes you have written?

Hmmm... I have done just about everything since the C64 version of *Matchday II*. There was *Arkanoid 2* across all formats (that's Spectrum, C64, ST and Amiga), *Platoon* (C64), *Vindicator*, *Quàndam* (which wasn't released here), *Typhoon*, *Operation Wolf* and *Robocop* (8-bit versions). I expect I shall be writing music for the 16-bit versions of *Robocop* soon enough. *Daley Thompson* and *Dragon Ninja* are the most recent games I have written music for. All the later titles are

TOILET HUMOUR

Getting to a toilet from the development dungeon is not funny. It's necessary to get through a locked door and bypass various rooms before getting to the appropriate destination. Why the locked door? Well, the facilities and the rooms are owned by the local Church. Programmers have often walked through (*and doubtless joined in – Ed*) Alcoholics Anonymous meetings.



■ *John here has several surnames which he uses at different times. It depends on the circumstances. He has been known to use John Amstrad and John Fudd. The most plausible name, though, is John Brandwood which appears in the credits of most of the games he writes. John is Ocean's ace 68000 coder; he's also the guy that moans a lot. His pet hates include Jonathan playing his compositions too loudly, writing music drivers for Jonathan's music, and the AmigaDOS operating system.*

across all formats.

The audio tape, the Challenge, that accompanied the recent *Daley Thompson* game was great fun to do. I wasn't restricted to three or four voices. I hired a drum machine and a mixing desk. It was great.

Do you have to stick to film or arcade machine sound tracks when you write the music for licences?

Yes and no. If I'm doing an arcade conversion then usually I base the theme on the arcade version. Of course, I don't have to stick to the arcade theme, but generally they are excellent and worth using. Sometimes an arcade game manufacturer will insist that the computer version sticks very closely to the arcade game – that also goes for the music.

For the first time ever I have been sent the music score by the arcade producer. It's for *Chase HQ* which I shall have to convert shortly. All the arcade stuff uses multiple voices and it can be really frustrating cramming a gorgeous stereo composition into three channels. Of course I prefer doing my own stuff if I've got the choice and the time.

Games are so varied and the action ranges from non-existent to overkill; there must be times when you create a tune and find it doesn't fit with the gameplay?

Not really. It's not just a matter of it not fitting. Everyone has a personal view on the matter. Some people like Opera, others Jazz, and others Rock music. It's all down to personal taste. I could write something that I think really goes with a game; someone else might think it's crap. Who's right?

Just the other day I was working on music for *Run the Gauntlet*; there were a few programmers outside the room when I played the track. "Bloody hell, that's bloody awful," was the only response I got. They literally ripped my music to pieces. I'm now working on another version.

What restrictions do programmers put on you memory-wise?

On the Spectrum I've got between 3.5 and 4K for music. I'm allowed a similar amount of memory on the C64 – 5K at most. As for the ST, well... with *Rambo III* I had 17K to play with, but I couldn't use all that because the game was programmed in such a way that samples couldn't be used. I was restricted to the usual AY [*the name of the chip inside the ST*] stuff – and there's no way I have time to write 17K of music – that equates to over 30 minutes' worth of tune. When I write Amiga *Rambo III* I'll have more memory – probably 40K. With 16-bit stuff in general I have around 40k to use, but that's because samples take up so much memory.

What do you dislike about computer music; what sort of sound capabilities would you like to see in micros?

It's nice to get away from the restriction of computer music when I go home. I can play on my synthesiser without worrying whether the resulting tune will fit into memory or whether I'm using more than three voices (four in the Amiga's case).

I get bored really quickly writing note values into the computer so I try and spend most of my time playing around on the synth. Deadlines are another frustration; I'm given roughly two weeks to complete each tune. Naturally I'd like a lot longer. Occasionally a tune leaves my hands without being perfect. I don't like that.

TOO LOUD

At Ocean there's only a thin wall shielding the arcade alley from the music room. It's a constant contest to see which room can produce the most noise. The arcade alley houses all the latest arcade machines that the programmers have to convert to 8 or 16-bit while the music room is Jonathan Dunn's pad. The only people that suffer in this power struggle are the programmers.

DIRTY DEEDS DUNN DIRT CHEAP

"The first stage in writing computer music is composing an original tune, although that's not always required (some games must have the same music as the arcade machine). It's my favourite part of the job; being creative. Generally I sit down at the synthesiser and tap keys until I find a riff or a chord sequence that I like. I write the bass line first and code that into the computer. I get the base line playing on the computer in a continuous loop and then play a melody over it using the keyboard. When I've got the melody I can get the computer to play that as well. In this way I can build up a tune in sections.

"At one point I programmed the sound chip itself, particularly on the C64, but now I don't worry about that. It's usually because I'm too busy churning out tunes. The Amiga sound chip looks pretty impressive; I've looked through the technical data and have already come up with some theories on how to make it do things. The ST's sound chip is limited: it's the same as the Spectrum's except that there is more processing power for running samples. At the moment I've got to explain to the programmers what I want the sound chips to do. That can be tricky! They write the drivers; I just provide the music data.

"Getting music from the synth to the computer is no problem; I know what the note values are simply by playing them. I play a few notes and write their values into the computer. Everyone here uses STs for development so all the note values are placed into a program on the ST which can be read by any group of programmers. This is particularly useful when a game is coming out on all formats. I give the same music source (note data – not programming code) to any programming team. Getting note values from the synth to the computer isn't ideal; it would be nice if I could store the complete composition on the synth and then download it to the computer. Unfortunately that would mean encroaching on the programmers' time. It might happen eventually if I push enough."

DUNN ON SAMPLING

"Sound sampling was originally done on the ST using *Replay 4*, but because the hardware lacks filters a lot of noise gets through. This becomes very noticeable when the sample data is transferred to the Amiga. It's a pity because the *Replay* software is excellent. Just recently we got Future Sound. It seems really good. All sampling from now on will be done on the Amiga and ported to the ST."

If you think three or four music channels are a restriction then try writing buzzer music. The 48K Spectrum is a real buzz box. I hate writing buzz music. The same goes for the PC. Another damn buzzer.

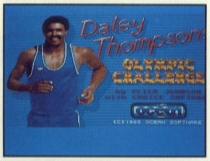
What's needed inside a computer is the sound capabilities of something like the Ensoniq EPS with eight tracks, individual stereo positions, loads of envelopes and sample filtering. Most of the arcade machines are almost up to that standard. The *Chase HQ* arcade machine, for instance, has six stereo channels. It won't be long before home micros have startling sound capabilities; the Konix Console looks interesting.

Do you have any favourite computer composers or computer compositions?

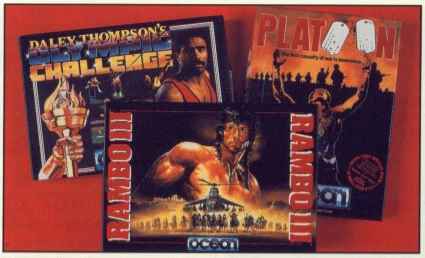
I rate Tim Foley at Software Creations. He wrote the music for *Bionic Commandos* and *LED Storm*... he seems a very proficient musician. Rob Hubbard was an excellent musician, but now that he has gone to the States he's just a legend. There was a time when music was the most important part of game. Why, it sold games. It was all Rob's doing. His incredible knowledge of the C64 sound chip and wonderfully original tunes changed people's ideas about computer music. The days of the buzz, beep and squeak were gone.

Rob's music certainly sold games. Nowadays if a game has impressive graphics, good music and attractive packaging the game will sell. It seems to me that people aren't too worried about gameplay. If it looks good and sounds good they'll buy it. All computer users want are flashy demos to show off to their friends.

The *Chase HQ* arcade game has good music. I'm looking forward to converting it to home micro format. The high score section has a sort of rap. It has voices saying, "Enter your name y-y-y-your name". It's going to be tricky doing the conversion – impossible on the Spectrum – but I'm going to try anyway.



■ *As well as writing the tune for* **Daley Thompson's Olympic Challenge, *Jonathan wrote the music for the accompanying free audio cassette. The track was called the Challenge which Jonathan put together using a D-50 synth, drum machine and a mixing desk.***



■ *Just some of the games Jonathan has written music for during his 18 months with Ocean. Many of the titles shown here were written across all formats; the music had to be altered for each machine by Jonathan.*

Are you left to do the sound effects and if so what is the procedure?

Sound effects? Yes, unfortunately. There's no set method for creating them. An explosion is an explosion; white noise with random frequencies thrown in. I treat effects as though they were very small bits of music. I've got a frequency envelope generator to help me. I think about a sound in terms of its attack, decay and so on. After that it's just a matter of converting that to a sound envelope. Easy. It takes me half a day or so to create all the effects for a game. On average there are 12 different sounds in a game.

Occasionally I use two channels for the tune and a third for effects. I could use all three channels for tune or all three solely for effects – it depends on the game. I prefer games that have three- channel (or more) music throughout.

Do you own a computer or play games?

No, I don't have a computer. Ahh that's not true; I've got a C64 somewhere... it's collecting dust. I don't really have any desire or need for a computer. After looking at a screen all day it's nice to do something different in the evenings. That said, I have recently got my hands on Steinberg's *Pro 24* and that really is impressive. It's incredibly complex and has so many features that I would never use. I might get an ST simply to explore the software to its full.

I live in Preston so I often go to Blackpool to play in the arcades. *Powerdrift* and *R-Type* are two favourites. Games for the ST and Amiga just get better and better. They are almost up to arcade quality. Even so, I tend not to play computer games; there is a certain magic about arcades.

LINEAR DIGITAL SYNTHESIS

Ocean's Jonathan Dunn uses a Roland D-50 synthesiser to create tunes for computer games. The D-50 employs a special technique, Linear Arithmetic (LA) technology, for producing sounds. Roland's proprietary circuitry for digital synthesis takes a linear approach – as opposed to conventional, non-linear, digital synthesisers which warp sine waves using the grand-sounding non-linear algorithmic synthesis. LA's end result, it is claimed, is more realistic sound.

The D-50's specifications, if you must know (*G o on propellorhead, you're dying to tell us – Ed*), follows: 61-key velocity sensitive and pressure sensitive keyboard that can be split; in-built digital effects including equaliser, chorus and reverb; internal memory capable of storing 64 patches (sounds); bender/modulation, joystick, volume, and aftertouch controls; 80-character LCD. It's a hell of a machine, but for around £1300 you'd expect that.

■ *The Roland D-50 supersynth. Extra memory is available in the form of thin, compact, reliable cards. Each card can store 64 sounds.*

According to Jonathan the only problem with the D-50 is that it is not multitimbral. This means only one sound, two at most by splitting the keyboard, can be assigned to the keys. For this reason Ocean are selling the machine in favour of the Korg M1.

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Money management can be a complicated, and very often a frightening, experience for those not blessed with the skills of an accountant. It is therefore great to find a package that proclaims to be easy enough for anyone to use while managing to be "The Worlds most sophisticated Personal Finance program". With claims like that you'd be right to expect something special, but does it deliver?

Personal Finance Manager is a fairly sophisticated money management program that will allow you to keep track of all your various bank and building society accounts as well as those infamous 'plastics'. The program comes to you on a single, unprotected disk complete with a comprehensive 50 page manual which luckily includes a tutorial to get you up and running in no time.

PFM works in a similar way to all the other money management products on the market, so if you're used to using a package such as Digita's *Home Accounts*, you should feel instantly at home.

Using the program at its simplest level involves you entering the transaction date, the amount, a short description of the transaction and whether the account is to be debited or credited.

In addition to being able to keep an eye on the usual debits and credits, you can also tell the program about any standing orders so that regular payments are never forgotten and are automatically carried out. You can also define up to ten different budget catagories which is useful for determining where your money is actually being spent.

Other features include reconciliation, which is a very clever system that attempts to balance the books if your bank statement doesn't quite tally with what the program has calculated. *PFM* will attempt to balance the statement by highlighting any cheques and deposits that may not have made it through the system. You can also manually defer any cheques and deposits by merely turning the particular transaction on or off.

Let's get graphical

PFM includes three different types of graphical reports. The first, the balance plot, allows you to see at a glance how an account balance differs over a particular length of time. When your balance drops below zero, all points after that date are highlighted in red until you move back into the black.

Another useful graphing function is the budget comparison bar chart which shows the value of each budget category compared to the actual expenditure of each. It is simple enough switch the graphics functions on or off.

The final graph is the familiar bar chart. *PFM*'s bar chart shows the distribution of entries for the different budget catagories over a specified period. All the graphs are clearly designed and, most importantly, of real use. The one bad point is that no print option is included, so you're unable to produce hard copies for future reference. You could of course carry out the usual [ALT] [HELP] combination, but the the final printout can end up looking decidedly tacky. You can, however printout all your transactions for a given time in the more conventional text-based bank statement format.

Financially viable?

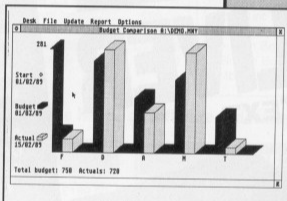
Personal Finance Manager is a simple program, however it still manages to offer some powerful functions such as reconciliation. Compared to other programs of this type, including Digita's *Home Accounts*, *PFM* can hardly justify the rather adventurous claim of being the most powerful personal finance program available on any computer. The lack of any method of printing your graphs is definitely a serious omission that will hopefully be fixed in a future release.

To conclude then, if you're in the market for a money management program that is easy to use – and you're not really worried about the lack of the more powerful accounting features such as double-entry accounting offered in other packages - then *Personal Finance Manager* is certainly worth considering. ■

REVIEW

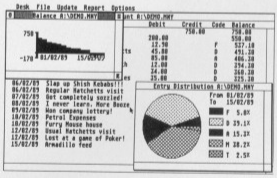
DOUBLE VISION

Unfortunately *PFM* doesn't support double bookkeeping. This, for the uninitiated, is simply a matter of balancing a credit in one account with a debit in another.



■ *Being able to budget yourself and then see on screen how much you have over spent can be depressing!*

■ *PFM's screen display allows multiple windows to be opened at the same time. When you shrink or expand a window, any graphs are automatically re-scaled.*



for

- Easy to use
- Number of entries limited only by memory
- Powerful graphing functions

against

- Can handle only one account at any one time
- Includes no way of printing graphs

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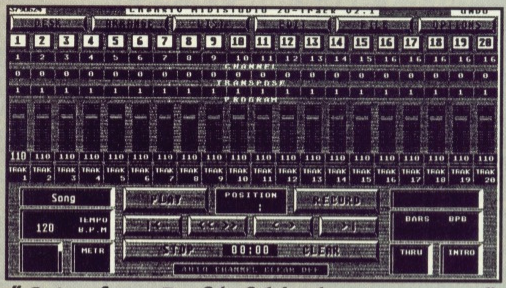

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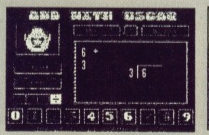

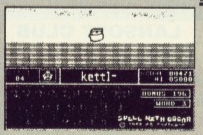

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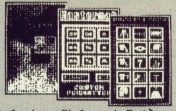

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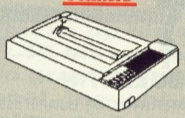

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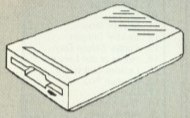

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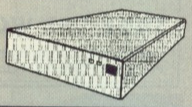

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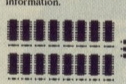

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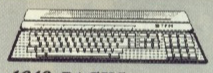

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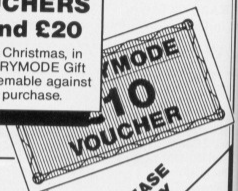

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IS THE ADVENTURE OVER?

REVIEW

Are adventurers dying out? Is the valiant warrior fighting a losing battle against the arcade conversion mongers? GARY BARRETT picks up his sword and wonders whether 16-bit games are paying too much attention to graphics at the expense of the more traditional, thought-provoking adventure gameplay.

Adventure games have been around since way before home computers. The first one, *Colossal Caves*, was written in the language FORTRAN on a mainframe computer by a duo called Crowther and Woods. It was basically a common or garden fantasy text-only adventure, but at the time it seemed very far from that. It aroused great interest amongst those lucky people that had access to it.

When home computers did come on to the scene, the conversion of *Colossal Caves* was inevitable and so for a time there was version after version of it. Eventually people started to explore other avenues: futuristic, horror, present, prehistoric and humorous settings.

As time went by computers began to have more memory and their graphic capabilities improved too; the result was graphical adventures. The first few had only a handful of still screen graphics and they were generally poor quality. Just because you can write doesn't mean that you can draw too, and adventures were still only selling in small numbers compared to arcade games. Most adventures were still being written by individuals or small companies where a full time artist was not feasible.

There came a time when people were beginning to see adventures as one shot games – solve them once and you'll never try again. Something had to be done to make it so that it wasn't just a matter of using the appropriate object at the correct time and in the right place, they needed to be of a world where things happened anyway, not just because you were there. The first adventure to try this was *The Hobbit* by Melbourne House. *The Hobbit* was a nice try, there were characters that did their own thing; Thorin Oakenshield sat down and sang about gold, Galdalf wandered off and Elrond kept giving away lunches. At first they were entertaining, but after a while they just became annoying. A lot had been attempted, but unfortunately it was too much for eight bit machines.

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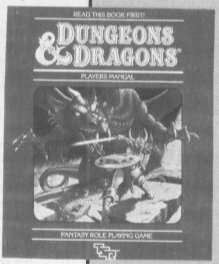
Text or Graphics

The world was still divided into two schools: text-only and graphical adventures. Text-only adventures were getting more and more detailed in their textual desciptions, in effect you were getting a novel with problems rather than just a series of problems. Infocom still held the title of best text-only adventures. Graphical adventures were getting much better artwork, but the text was still short and lacking detail. A compromise was needed and Magnetic Scrolls made that compromise with *The Pawn*. The Pawn had both long and detailed text and excellent pictures. Magnetic Scrolls followed up the Pawn with *Guild Of Thieves* which boosted people's opinions further. Adventures had come of age.



Role on, Role off

Here begins another controversy – Role Playing Games, or RPGs to their fans. Those who play the classic *Dungeons and Dragons* around the camp fire of an evening – not necessarily the rubber sword brigade – will tell you they are playing an RPG. Adventures, they would maintain, are a quite different thing. RPG purists used to look down on computer adventures as a pale imitation of the real McCoy.

As computer adventures became more sophisticated, lurking in the background all the time were attempts to draw role players into the

DEVIL WORSHIPPERS?

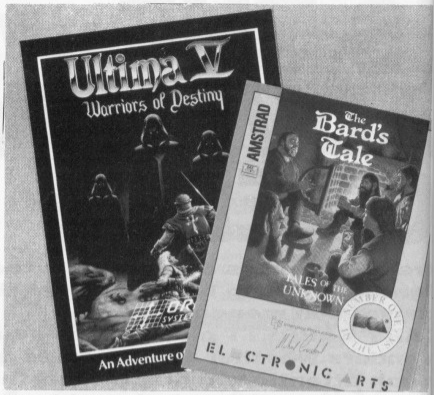
Occasionally newspapers run stories on devil worship, and if they can come up with a link between someone involved and RPGs they'll exploit it to the full. Admittedly, player characters worship deities that are un-Christian, even demons and devils, but that doesn't mean the players themselves do. Let's face it, Christianity itself doesn't have a blameless track record – The Spanish Inquisition for one – and dunking people thought to be a witch in river was not exactly a fair trial. If they died they got a Christian burial and if they lived they got burnt at the stake. Sounds like a raw deal if you ask me.

fray of the adventure world. Most games, it must be said, fell short of that goal. Computer role playing games are generally, "Kill the monsters and take the treasure." Role playing does often involve killing, but that's not the only part, and software houses failed to grasp this. The result was that most computer 'role playing games' were in fact just hack and slay and failed to attract the role players. *The Bard's Tale* and the *Ultima* series of games are the best of the pseudo-RPGs, but the US Advanced Dungeons & Dragons' (AD&D) game *Pool of Radiance* is eagerly awaited by many, due from US Gold in early summer. It could be what role players have been waiting for.

Yes, but what are RPGs?

During the early '70s wargaming was very popular pastime. One regular player among them was a certain Gary Gygax. He decided to write his own game (we're talking about a set of rules for a boardgame, not a computer version yet) and that game was the now famous *Dungeons and Dragon* (D&D). It began life not as a wargame in the traditional sense with huge armies split into units battling it out over miles of terrain, but was on a much smaller scale, using just individuals rather than armies.

These individuals had to be



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something special though not just your usual bunch of tired soldiers but heroes from fantasy novels and films, potential dragon slayers, mighty wizards, great masters of stealth and warrior priests dedicated to carrying out their deity's work. Who wants to be a brainless peasant when there are ravenous monsters out there to defeat and stunning princesses to rescue from them?

A set of numbers

In a conventional D&D game, heroes, or player characters as they're called, come into life in a simple way: random dice rolling. Dice are used to generate six statistics for the character: strength, intelligence, wisdom, dexterity, constitution and charisma. The statistics affect how capable the character was at doing certain things: feats of strength, casting magic spells, casting healing spells, manipulative tasks, resistance to disease and harm and how other people saw them and reacted towards them. A high value for a statistic meant the character is very good, and low meant poor.

A profession was then chosen for the character: fighter, magic user, cleric or thief. Then was the time to set off into the world and earn fame and fortune, or perhaps steal it.

While the players are busy generating their character another individual will sit in some darkened recess thinking of things for the players to do. That person is the 'Dungeon Master' (DM). The DM has the awesome responsibility of controlling the rest of world that the player characters (PCs) live in, he has to 'be' every other creature that they came across, and needs to know something (or be able to make something up quickly) about every place they go to. It sounds a daunting task, but it's also a very creative one and after a few games the DM is into the swing of it and things begin to run more smoothly.

Dungeons and Dragons built up a cult following amongst students and eventually it crossed the Atlantic to Britain. Over here it became just as popular. After a few years there was a new version of the game, with the stunning name of *Advanced Dungeons and Dragons*. The new game was very different from the old:

PROBLEM SOLVING IN RPGS

In general, role playing problems can be solved in more ways than one: consider a thief doing a spot of burglery.

A thief breaks into a house and comes across a chest. The thief examines the chest looking for traps, and the DM rolls some dice and compares them with the thief's 'find traps' skill. There appear to be no traps on the chest and so it's time to reach for the lock picks to try and unlock the chest. More dice are rolled, this time comparing with the thief's 'open locks' skill. Unfortunately, your finding traps skill wasn't up to scratch, there was a trap on the chest, and a needle pricks the thief's finger. Now the health statistic come into play to see whether you survive or not.

If the roll of the dice hadn't been kind to you and you hadn't been allowed to open the chest, you would have had to find another solution. Either persuade another character to open it for you, or alternatively try brute force and ignorance to smash the chest open. That risks breaking anything fragile and also making lots of noise, possibly resulting in being caught.

The possibilities are endless and there are always players who think of something that hasn't been accounted for, which is fun for both player and DM alike. There are times in computer adventures when you come up with what you think is incredibly cunning plan, only to receive the message "You can't do that," which is not only irritating but also shatters the illusion of being in another world.

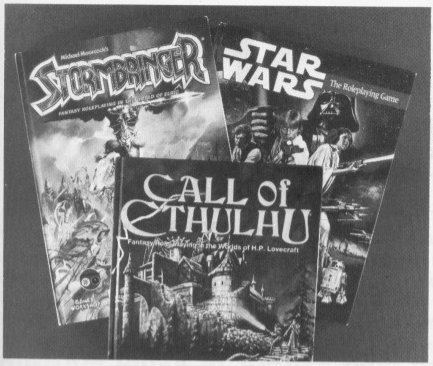
ADVENTURE OR ROLE PLAY?

A question that is often asked is what the difference is between role playing games and adventure games. The answer can be hard to pin down.

Straight adventures have preset objectives, and most problems can only be solved in a certain way. The characters that you control and guide through the adventure are created by the game's designer and have most of their reactions pre-determined. If you meet a monster then it's often a case of you die because you haven't the right weapon or you kill it because you do.

In role playing games, the character that you use is one of your own creation. In many games players get sidetracked and go off at a tangent, the result being that objectives can change as time goes by. Fighting a monster is not resolved by simply hitting it when you've got a sword, it fights back and the combat could either way.

Another difference is that adventures are puzzles that can be completed, and when you do so you won't play it again. Role playing games never have winners, characters either live or die and if they live they carry on their existence having gained new knowledge and skills from their experiences.



it was still fantasy, but many rules had been added, deleted and changed and the game itself was no longer a boxed set, but two hardback books; one for the players and another for the Dungeon Master.

Games without Frontiers

Now you can get games for a multitude of different settings, no longer is D&D just fantasy. Science fiction (*Traveller*), space opera (*Star Wars*), horror (*Call of Cthulhu*), silly (*Teenage Mutant Ninja Turtles*), post holocaust (*Gamma World*), oriental (*Bushido*), mediaeval (*Chivalry and Sorcery*), 20th century (*Gangbusters*) and of course fantasy (*Stormbringer*) are all supported now.

Thought provoking

Adventures and role playing games are both hard work for the programming and design team on the development side. Adventures have masses of text, and all of the problems have to be worked out with every possible player action anticipated if it's going to be well received. Role playing games likewise need very extensive play testing to make sure that they're not too easy or difficult. Arcade games on the other hand are much easier to test and problems are often much simpler to detect and debug because the game crashes, the ship drifts off the screen, the timing gets confused or a variety of other similar problems are clearly visible on the screen. In an adventure, a bug mightn't become apparent until many moves after it happened.

The result of the extended development time for adventures and role playing games is that they don't come out very often. When they do sales aren't as high as the coin-op conversion of "Let's kill all the aliens again, but with different graphics and some new tunes" because there's not as much hype. Small software houses can find they've spent so much money developing a game that they simply can't afford to publicise it! It doesn't take much thought for software companies to realise that they'd make much more money bring out four arcade games instead of one role playing game or adventure. Having said that, adventures do tend to have a longer shelf-life than arcade games, so the money rolls in over a longer period.

What's to become of me?

Now that we've established what adventures and role playing games are it's time to discuss their fate. Adventures have always been a minority market compared with arcade games, but now more and more people are just going into shops and picking up the latest arcade conversion, simply because it's been so hyped and is so well known that they trust the software houses. In many cases they get home and find out that it's a load of garbage and they could have spent the money on something more fulfilling.

Even if it is a good conversion you often get bored of it before you complete it, there are only so many aliens that you can blast, or little yellow men you can flying-kick before you think, "Why bother?" This is a place where adventures and role playing games can come in. No-one's saying you won't get bored or complete the game in the end, but the amount of time spent achieving it is greater.

If the trends continue and all people do is buy arcade games then the future looks bleak for adventurers and role players. Sales would start to fall, the profits would dwindle and less games would be released. The end result could be that adventures might cease to exist and the computer users that have been deprived of their adventures will seek their entertainment elseware.

Computer software won't ever kill off true role playing because they don't compete directly. Lets hope the adventure and RPG sticks around, because if it doesn't there may be a lot more 'devil worshippers' wandering the streets, entering those evil shrines masquerading as amusement arcades and sacrificing the occupantants with sharpened joysticks. ■

© 1988 Robtek Inc.

REVIEW

FACT OR FICTION?

If you're wondering about the difference between science fiction and space opera then the simplest way to explain is by comparing two films, *2001* and *Star Wars*. The former generally obeys the laws of physics and is an extension of 20th century technology, whereas the latter takes the laws of physics and throws them out of the window using impossible hi-tech gadgetry by the starship load.

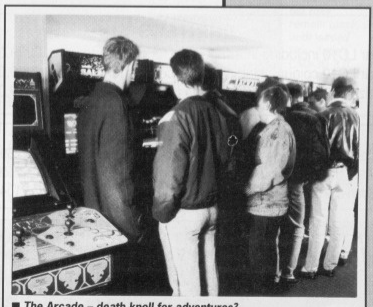
WHAT ARE YOU BABELING ABOUT?

The Hitch Hiker's Guide to the Galaxy **by Infocom has some of the most devious problems of any adventure. It manages to retain the humour of Douglas Adams' novels and still keep you amused and frustrated. One of the trickiest problems is when you're in the Vogon ship and need to get the Babel fish into your ear.**

You need a dressing gown, satchel, towel and junk mail (what do you mean you left the mail on Earth? Oh, dear.) Now, when you press the Babel Fish Dispenser Machine's button the fish plops down a drain. Block the drain with your towel and the next fish vanishes down another hole. Hang your dressing gown on a hook over that hole and the third fish gets eaten by a cleaning robot. Block the robot in with the satchel and the fish hits the satchel, flies in the air and is eaten by an upper-half-of-the-room cleaning robot.

What you have to do is put the junk mail on the satchel so that when the fish hits it the letters fly up in the air too, and the robot gets confused and catches the wrong thing. The fish then lands in your ear. Simple, really.

Problems like this occur in most adventures and it's just a matter of lateral thinking to solve the problems and having the right objects to do it with.



■ *The Arcade – death knell for adventures?*

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CYBER SCULPT

REVIEW

What do you do when you want to fill your screen with a tube of toothpaste? You could draw it using an art package but you never get to see the other side. CAD-3D packages have long supported such outrageous ideas, but creating images hasn't ever been easy. MARK HIGHAM looks at Antic's new modeller from all points of view.

£79.95 ■ ST only, colour or mono, needs 1Mb, *Cyber Studio* also required ■ Electric Distribution, Meadow Lane, St. Ives, Huntingdon, Cambs PE17 4LG (0480 496789)

Computer aided design (CAD) programs have long claimed to provide the ultimate environment in the manipulation of 3D images. They let you to view pictures from as many angles as you want, stretch them, view specific areas and even colour the faces. However, where CAD packages really fall down is in their creation of the original image. They certainly do a brilliant job of manipulating it once it's there, but designing pictures can be an horrendous experience.

When Electric released their popular CAD package – *Cyber Studio* – in the middle of last year, it managed some brilliant tricks with 3D images. *Cyber Studio* even produces stereo pictures which look great through a pair of red/green 3D glasses.

Sculpt expands on the picture creation facilities so that your basic image may be created from within *Sculpt*, saved to disk and then re-loaded into *Studio* where the superior 3D handling features take over. The advantage of this type of approach is enormous. Not only do you make use of the excellent 3D manipulation facilities of *Studio*, but the areas where it fails are compensated for by *Sculpt*.

Sculpting the way forward

Sculpt works by giving you options in designing a simple template and then building on this in the 3D editor. Each template is given a name so that it can be pulled into the final image and manipulated, thereby giving you the greatest possible control. It's all very well creating a complicated template with more holes drilled through it than Bonnie and Clyde, but when you start doing anything decent with it everything can soon become remarkably complicated. Consequently many separate templates are beneficial.

You have access to a simple polygon drawing routine which creates polygons from 3 to 32 sides. These edges can then be rounded, if desired, and the template saved onto disk for later use. Once you've got this basic template, it's held in memory so that whatever changes you might make to it as a 3D picture, the basic template can be recovered at any point. Several different shapes and sizes of polygons are possible by making use of a single template.

A primitive choice?

A Primitives menu option allows you to enter the 3D editor by first creating simple cubes, discs, prisms or spheres. A short-cut to designing your template is to select one of these objects and let it create its own template. This can then be changed further by editing the template.

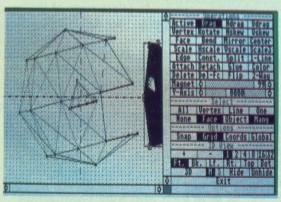
Once you've got your image this far it's a simple process to spin it, extrude (pull out across a defined length) and push or pull objects into endless different shapes. Using a path editor you're able to define a line to whatever dimensions you wish and then use this in the creation of an object. You could, for example, take a circle and use your defined path so that the circle can be twisted along this path into whatever pattern you choose. It's a complicated process because unless the number of rotations and the basic path structure have been properly defined, you can end up with something grossly unrecognisable. There are simpler spinning methods which rotate around a central axis or into themselves – not a lot of use since the whole thing becomes so complicated it's impossible to tell what's happening.

What next?

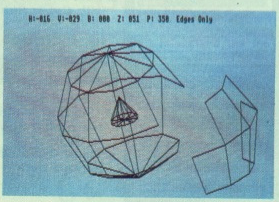
Okay, so you've got a set of templates pushed and pulled into something resembling the image that you want to use, now what happens to them? The next stage is to go into the 3D editor where you can take the first tentative look at your image as a three-dimensional solid. It can often

TAKING A CLOSER LOOK

***Sculpt* lets you view your 3D image from six different perspective points – top, bottom, left, right, back and front views. When you're reasonably happy with what you've got, there an option to view it in 3D. Here the entire screen fills with your picture; you can zoom into specific areas or rotate the image to any position you want by using the mouse.**

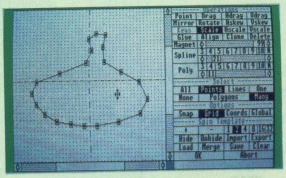


▲ *The main Sculpt screen. You can select specific faces and colour them but they remain black until loaded into Antic's CAD-3D 2.0*

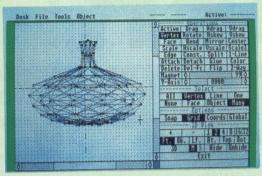


▲ *Pulling a face away from the image and then viewing it as a 3D picture. Sculpt's power is in the range of features for manipulating 3D images.*

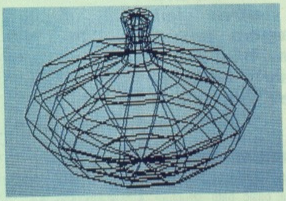
FROM SCULPT TO CAD



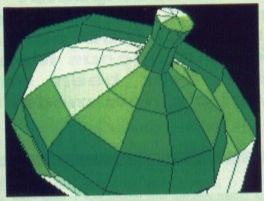
■ *You begin with a simple polygon and manipulate vertices to create your own shape*



■ *It's then a simple step to rotate or stretch your image but it can give some odd results.*



■ *The 3D image as viewed from within* Sculpt.



■ *Loading it into* CAD-3D *then gives good results.*

be a daunting process because if you're not careful you've got all manner of lines just where you least expected them. However, if you got this far without considering some method of self-mutilation then you have access to a whole range of features. The basic image can be expanded upon by positioning vertices across the plane and then joining each set of three to form additional faces. These may be placed anywhere in the object. Initially they won't really exist until you select an option to give an edge to your new face.

Other features provide you with options to select areas of the image that can be bent through a surprisingly wide curve. You can scale some or all of the picture across a single plane or all three planes. Or, if you're feeling really dangerous, skew them through different axes to produce some very unusual results.

The clay way

Sculpt treats its subject matter as if it were a clay-like solid. This allows you to grab vertices and pull them into new positions, changing the design of your object. Simple commands then allow you to rotate or bend the result. A magnet feature permits you to move over the top and pull the points towards the magnet depending on the power of the magnet.

There's a 3D mirror, which can be positioned anywhere on the screen, that will exectly reproduce the selected items. If you've created a complicated image, or if you wish to extract certain faces from the images, then you're able to select areas of the image and divide them into individual images. These may then be introduced, along with other templates, and treated as separate entities.

Where the cross over with *Cyber Studio* begins is in the colouring of faces. *Sculpt* allows you to select specific faces and then colour them with variations from a definable palette. However, you cannot see any of these changes until the picture is imported into *Studio*, where the colour palette is maintained.

The final 3D image (colour palette and all) can be saved onto disk and imported into *Cyber Studio*. Since the pictures are entirely compatible with *Studio*, you can also take images from here and import them back into *Sculpt* for further work.

A new direction

Cyber Sculpt is not intended to be a cheap way of venturing into the CAD enviroment. For most purposes *Cyber Studio* is an adequate way of designing images, even though its design features can be restrictive. However, if you're looking for more professional enviroments usually only found in expensive professional packages, then the combination of *Sculpt* and *Studio* is sure to satisfy. The method of saving data and then reloading it back into a separate package for further manipulation is never an ideal way to go about using packages. Admittedly you can take advantage of the best of both systems, but in the end you can find you don't properly exploit either.

What *Sculpt* does, it does well. It performs brilliantly as a tool to spin, stretch and manipulate polygons and is surprisingly fast even with the more sophisticated designs. The manuals offer extensive tutoruial sessions aimed at the absolute beginner as well as a reference guide for those conversant with the enviroment. Overall it's an amazing add-on for seasoned CAD users. ■

features 0 1 2 3 4 5

performance 0 1 2 3 4 5

ease of use 0 1 2 3 4 5

manuals 0 1 2 3 4 5

format value 0 1 2 3 4 5

for

- Options to twist objects into any conceivable shape
- 3D Primitives as standard
- Fast and fully compatible with *Cyber Studio*

against

- Cannot colour objects
- Can take some time to learn what to do and how to do it
- Need *Cyber Studio* for any serious work

GOING BACK TO THE STUDIO

Antic's *Cyber Studio* is a professional CAD package renowned for producing superb results. It incorporates two separate programs for use on 1040 STs or higher. These are *Stereo CAD-3D 2.0* and *Cybermate*. *Stereo CAD-3D* is an advanced CAD program including camera views with variable zoom and wide perspective control. This means you can examine your image from any angle. The resulting object can be coloured and up to three light sources used to provide considerable realism. Background lighting with variable intensity can combine to add the final touches to a colourful design.

Full screen images can be viewed and saved in either *Degas* or *Neochrome* formats. The advantage to this is that you can then use them in your own animation programs or as part of a game. High resolution printer outputs can be obtained.

***Cybermate* is an animation control language designed primarily for use with *Cyber CAD* creations. It takes over from *CAD-3D* in that it works with standard Forth commands and specialised display control statements to provide you with your own smooth and fast animation sequences.**

***Cybermate* uses sophisticated packing routines to store up topanel text 10Mbytes worth of frames on a standard 1040 machine. These are then played back at speeds of up to 60 frames per second. Sound effects can be added and limited special effects included into the sequence. Since the Cyber range is able to create stereo images, a pair of 3D spectacles can quickly have you gasping for breath.**

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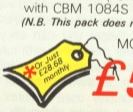

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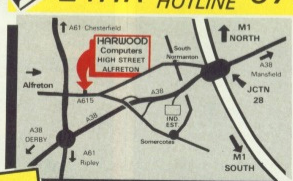

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GRAPHICS

MOVIESETTER

If you've ever wanted to produce your own cinematographic masterpiece, but lack the funds to hire a studio, film crew and actors then Moviesetter could be the program for you. You create the cast, draw the scenery and then edit to your heart's content with only your Amiga fo help. GARY BARRETT tries his hand at th directing lark.

Gold Disk/HB Marketing ■ £69.95 ■ All Amigas ■ Brooklyn House, 22 The Green, West Drayton, Middx UB7 7PQ (0895 444433)

For many people computers are just arcade machines without a coin slot, but they can do much more than that. Yes, there are many business applications, but they seldom use the graphical potential of the machine. A bar chart is one of the most boring ways possible to display information. How much better it would be to have pacman pie charts and talking tables. With an animation package this is possible – it takes more effort, but the end result is more informative. If that doesn't appeal to you then you can also create your own cartoon characters and have them run around in weird worlds. Draw your boss, crush him with a huge hammer and make him scream.

Getting your act together

Moviesetter comes in two forms: a 512K version and 1-megabyte-plus version. With the former you have a separate 'set editor' and 'movie editor', and in the latter you have both in memory at one time. This is so that you can still have decent length animation sequences on a 512K machine. It's good to see a new graphics package that does run respectably on an A500 – an increasingly rare sight these days.

Before you start on your blockbuster movie it's worth having a look at the demonstration production supplied. It shows some of the more commonly used features: scrolling, sound effects and some of the predefined characters (or 'faces' as they're described in *Moviesetter*) stumbling around. There's also a tutorial production of a bouncing ball that the manual explains how to do as a simple introduction. After messing around with these two for a while you'll want to create your own sequences of animation and probably your own 'faces' too.

To the drawing board

Lurking in the pull down menus you'll find an option called 'set editor' which is used to create the still images which are to be animated. In effect it's a sprite editor – the still backdrops have to be created separately. There are two sets of icons: face related and drawing icons. The drawing icons allow brush selection, brush design, colour selection and various drawing options which include lines, boxes and ellipses.

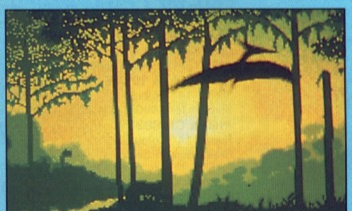
With the face related brushes you can animate your face set, add new frames, cut, copy and paste them and generally throw things onto the cutting room floor. Once you've finished your face set you can save it or just return to the main production menu. If you return to the production menu then the face set will still be in memory and can be used in productions, saving disk access time when you're just tweaking things.

Action!

Now that you've got a face set it's time to put it into action, using the production editor to specify the move

■ *Scene changes shown on the storyboard*

WIRE OR PIXEL



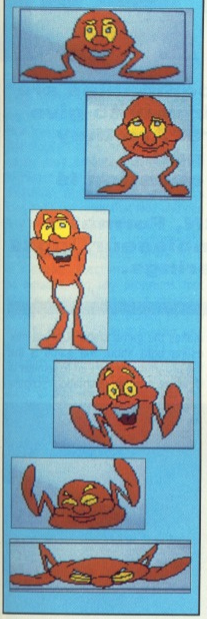
■ *Wire frame Pterodactyls fly in wire frame show pixel editing from Fantavision.*

There are two approaches that are used in computer animation: pixel blocks and wire frame. Packages that use blocks of pixels, sprites effectively, are *Fantavision*, *Zoetrope* and *Moviesetter*. With this approach you can have much more detail on the animations, but they do really eat up the memory, consequently you don't get to use very long sequences of animation.

Wire frame graphics however are stored as a series of points and so they take up much less memory. Another advantage is that you can do weird things with the graphics more easily, change their shape from one form to another, shrink them and they also move considerably faster. Unfortunately the animated characters tend to look angular and unrealistic unless you have many points. *Forms in Flight* and *Sculpt 3D/4D* all use this approach.

STEP BY STEP

■ *Stepping through the stages of the animation*



ments and timings for the animation. Clear memory by selecting 'New' from the Production menu, and then 'New' again from the Track menu. Either load the production from disk or memory and position it where ever you want on screen. Each time you click the left button the current face from the set will appear on screen at the mouse position and both the face set and frame counter will be incremented. When you've finished the sequence then it's simply a matter of hitting the play button and watching your work of art come to life. In playback mode you can either go frame by frame or watch the whole thing. You can also loop the sequence and run it backwards if you want to.

Choosing a location

Seeing your masterpiece doing its stuff on a blank white screen is not what you'd call exciting, so you need some background scenery. There are three pieces of scenery on the disk, but they're in standard IFF format so screens from any art package will do. You can't create backdrops within *Moviesetter*, you need a separate art package.

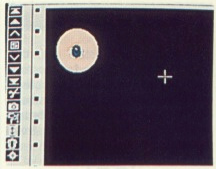
Select the background from the event menu and load in one from disk. You're then offered a choice of wipes for the screen, how a new background will appear as it changes. The wipes include a straight screen appearance which is quickest, but there are also some wipes that look better: parting curtains and even a spiralling screen. You have to chooose between speed and visual pleasantries. The background can scrolled up, down, left and right at a wide range of speeds.

Sound effects

Now that your character is stomping around the stage you'll probably want to add some sound effects. These, like pictures, are in standard IFF format and ned to be created outside *MovieSetter*. Sounds are added by simply loading one from disk and then slowly stepping through the production frame by frame until you reach a point where you want the sound effect. Click on 'Event' in the sound control window and the sound's added. Sounds be sent through the left, right or both channels. The volume can also be adjusted. The process is repeated until you've added all of the sound effects that you want and then you can play your movie again and listen while you watch. Sound effects are only played when when the movie runs forwards.

Back to the storyboard

If you select the 'Storyboard' option from the Production menu then you can see when any major changes took place in the animation. Changes that you look for are: track start, background changes, scrolling, sound, colour cycling, palette and timing changes and looping. With the storyboard on you can go straight to the frame in which any of the above take place. Useful if you want to know when the scenery changes or sound effects come into play.



■ *Using the set editor to create your cast*

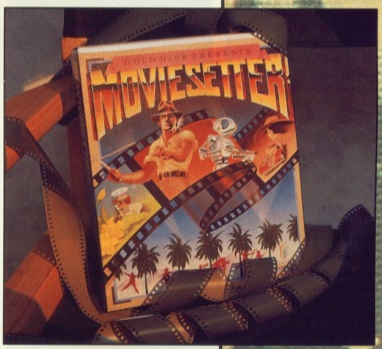
The duration of your movies is dependent of several factors: number of sets, backgrounds and sound effects and of course memory in your Amiga. Sequences of several minutes can quite easily be built up.

End of the show

Moviesetter is a simple and easy-to-use animation package with which you can make longish sequences of cartoon-style movies. Things do slow down a little if there are lots of large objects moving around at the same time, but the end results are pleasing. Creating your own background scenery requires an art package which is a pity, but not to be held against *Moviesetter*.

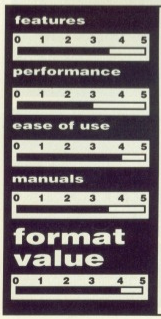
WYSIWYG

One of the best aspects of *Moviesetter* is the way that you can make minor changes and then simply re-run the movie (Oh no! Repeats already) and see the effect. It makes it very simple to tweak your movie to perfection. Unfortunately if you have only 512K of memory then you'll have to keep re-saving and re-loading programs, which makes life considerably more tedious.



ZOETROPE

Another recent animation package is *Zoetrope* by Antic Software. (This is almost identical to the ST *Cyber Paint 2* reviewed last month.) As far as manipulation of the graphics goes *Zoetrope* is much better with some very weird effects possible like crystallisation, buzz and ripple. Unfortunately Zoetrope requires at least a megabyte to run and so Moviesetter beats it on that count. *Zoetrope* is more of an animation package rather than a movie maker. It does do some impressive things, but at best it produces signs that could go in a shop window and attract people's attention. Moviesetter can on the other hand produce a full blown movie with sound effects.



for

- Simple to use set editor
- Long animated sequences are simple to produce
- Easy to include sound effects
- What you see is what you get

against

- Art package needed to design backgrounds
- Large sprites really eat up the memory

PD UP

More and more companies are going out of their way to give you free software. Are they mad? Of course not! The software in question is public domain. JASON HOLBORN, Format's resident PD connoisseur, looks at the latest offerings.

AMIGA

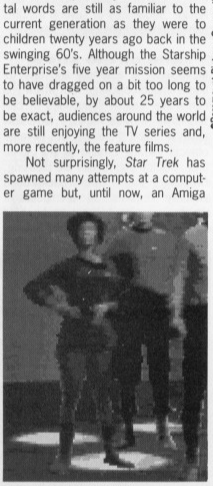
The programs listed in this month's Amiga PD Update section are part of the Fred Fish collection of disks. All disk numbers quoted refer to the Fish Library. Most will also be available from other libraries.

PD PLATINUM

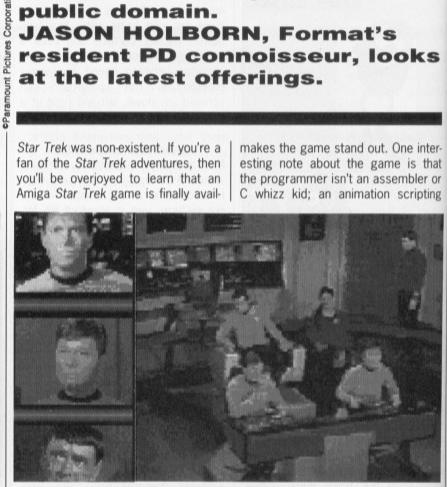
Star Trek

"Beam me up Scotty". Those immortal words are still as familiar to the current generation as they were to children twenty years ago back in the swinging 60's. Although the Starship Enterprise's five year mission seems to have dragged on a bit too long to be believable, by about 25 years to be exact, audiences around the world are still enjoying the TV series and, more recently, the feature films.

Not surprisingly, *Star Trek* has spawned many attempts at a computer game but, until now, an Amiga *Star Trek* was non-existent. If you're a fan of the *Star Trek* adventures, then you'll be overjoyed to learn that an Amiga *Star Trek* game is finally available; and even better, it's PD!



■ *Beam me down Scotty!*



■ *The bridge of the Starship Enterprise.*

If you've ever played the Firebird *Star Trek* game on the Atari ST, then you'll feel instantly at home with this Amiga incarnation. The game feels, looks, sounds and even plays almost exactly the same as the ST version. The game allows you to control all the main characters in the *Star Trek* series such as Kirk, Spock, Bones, Scotty, Uhura, Chekov and Sulu. Each member of the crew is responsible for a particular function of the ship; Uhura handles ship communications, Scotty looks after the engines (she'll nay take any more Captain!) and Sulu is responsible for the weapons systems. By moving between the different crew members, you must manage the running of the Starship Enterprise.

This latest *Star Trek* game runs in HAM mode (hold and modify) and uses graphics digitised from the TV series. The sound too is sampled directly from the series and really makes the game stand out. One interesting note about the game is that the programmer isn't an assembler or C whizz kid; an animation scripting package called *The Director* was used to write the entire game. This just goes to prove that there's hope for us all!

The bad news is that you'll need at least a megabyte to run the game and a second drive is most definitely recommended. *Star Trek* is a worthy PD Platinum winner and is not to be missed. The game comes on three disks and sells for only £8.95, which is the cost of the three disk alone! Currently, the only company we know of that sells *Star Trek* is George Thomson Services. You can contact GTS on 077082 234.

©Paramount Pictures Corporation

PD PLATINUM

File requester Disk 35

Many C and Assembler programmers will tell you that one of the most

AMIGA: BEST OF THE REST

As usual, space is our worst enemy and some programs couldn't make it into PD Update. Below is a list of other PD programs worth purchasing along with their associated fish disk numbers.

Wicon **■ Disk 154 ■ A very handy 'window iconifier' that lets you turn your Workbench windows into small icons which can be reopened later simply by clicking on the window's icon.**

VLabel **■ Disk 137 ■ A program to print fancy customised disk labels. It will combine an IFF picture and up to 50 lines of text and then print the result.**

ST: BEST OF THE REST

Here's a list of a couple of programs that caught our eye this month; but because of space constraints, failed to reach these pages in their full glory.

Sun-Moon **■ Disk A82 ■ Have you ever woken up in the middle of the night wondering where the sun has gone? No, neither have we, but you might find a use for this program. *Sun-Moon* calculates the rise and set of both the sun and moon at any location and at any time.**

MIDIDrum **■ Disk M7 ■ Not surprisingly this is an ST-based drum machine. Works through MIDI and is runs in high resolution only.**

UPDATE

annoying ommisions in Intuition – the Amiga WIMP system – is the lack of any standard file requester. If you've ever tried writing your own program that required the user entering a filename, you'll probably have resorted to 'Please Type in filename and press [RETURN]'. While this may work, let's face it, it's not really that nice and can lead to unforeseen problems.

File Requester is, unsurprisingly, a standard file requester in the form of a linkable object module. This can be included into any programs that can be passed through a standard Amiga linker (such as BLink). All you have to do to include it in your program is call the function `getfile()` and pass it a few parameters. Include the filename of the object file in the linker so that during compilation the object file is included in your final program.

File Requester is in fact the same one as used by software houses such as HiSoft and is written by that prolific Amiga programmer, C Heath of MicroSmiths Inc. If you program in C or Assembler, this is well worth acquiring.

ST

All the programs in this month's ST PD Update were taken from the *ST UK* collection of disks and therefore the disk numbers quoted refer to that collection. Most will be available from other libraries. This month's ST PD roundup has a musical flavour to it.

PD PLATINUM

Music Writer Disk M9

If you can't afford one of those expensive synthesiser thingies, you can still get decent enough music from the ST's humble Yamaha YM2149 sound chip. Just look at demos such as the 'Big Demo'. With *Music Writer*, the job of creating beautiful music on your ST becomes much easier.

Music Writer is a score editing package written completely in GFA BASIC that allows you to compose your musical masterpieces by pasting notes down on a stave in a similar manner to Activision's excellent *Music Studio*. The package currently only works in high resolution, but if you've got the PD *Mono Emulator* from Nick West this shouldn't present too much of a problem.

Clip Art Disks A77 & A78

Desktop Publishing. That's the latest craze in computing. Everyone from your local Vicar to the big multi-national corporations are using computer based desktop publishing systems to produce anything from the Parish news to reports on the stock market. But what makes a desktop published page look any better from a typed page? The ability to incorporate pictures and diagrams anywhere on the page is undoubtedly one reason. But if you haven't any talent for drawing, the desktop publishing dream doesn't always seem so sweet.

Clip Art is a collection of various useful images that can be cut out and used within your own page layouts. For example, if you were producing a poster for a party you could use images of a few bottles of bubbly and perhaps even a few balloons and streamers. These could be tastefully pasted around the borders of your poster.

This PD collection of clip art is in high resolution Degas format (PI3), but can easily be converted to either low or medium resolution using a program such as *Pic Switch*. The two disks contain a whole host of different images ranging from pictures of Abraham Lincoln to pots of flowers. There's also a whole range of different fonts that could easily be converted into GDOS compatible fonts. Really useful clip art is hard to come by these days, so it's a relief to find a collection that is both useful and, most importantly, free. If you're into desktop publishing or you use graphic images in your word processing, then these disks are well worth buying.

PD PLATINUM

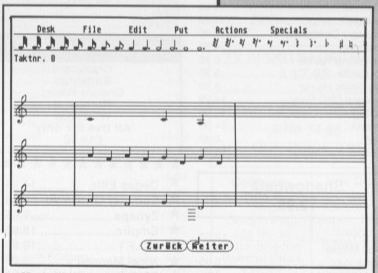
DX Voice Master Disk I22

Do you use a Yamaha DX 100 or DX 27 within your Atari MIDI setup? As well as the usual MIDI sequencing, did you know that you could also use your Atari to edit the actual sounds the synthesiser produces? 'Patch' editors – as they are called – are usually expensive, but if you look within the PD libraries chances are you'll find a patch editor for your synthesiser.

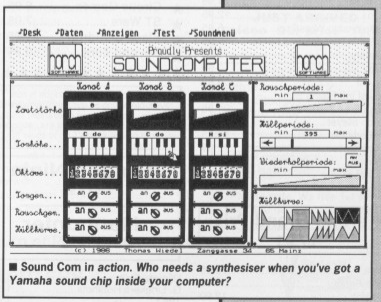
As anyone who owns a Yamaha synth will tell you, FM synthesis is not exactly the friendliest of sound synthesis systems. Using a computer based patch editor can make the task of designing new sounds so much easier. This particular PD patch editor is for the Yamaha DX 100 and DX 27 synths. It allows you to change all the different parameters and settings of the FM sound operators and then have the results dumped to your synth.

Sound Com Disk M9

Sound Com is a very powerful program that will be of particular interest to any GFA BASIC programmers. The program, as you may have guessed, allows you to design sounds for use within your own GFA programs. Although it is fairly technical and the instructions are written completely in german (vorsprung durch sound chip!), it shouldn't take you long to start churning out some impressive sounds. The program only works in high resolution, but, once again, this program is a very good reason why should should get your hands on a copy of Nick West's *Mono Emulator*.



■ *Music Writer in action. Could you be the next Jean Michel Jarre?*



■ *Sound Com in action. Who needs a synthesiser when you've got a Yamaha sound chip inside your computer?*

THE SUPPLIERS

In the UK, the following companies are responsible for distribution of ST and Amiga PD software. To find their full addresses, give them a ring or scan the advertising pages.

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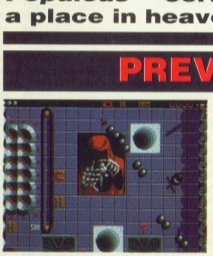
NEWS

SCREEN PLAY

It's just one exclusive after another! MARK HIGHAM and GARY BARRETT have spent last month pestering software houses for all the hitherto top secret new releases. This month we give you the first 16-bit review of the 16-bit *Ultima V*, and the divinely inspired *Populous* – certain to earn you a place in heaven... or hell.

PREVIEWS

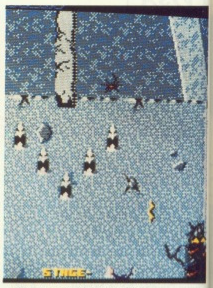


▲ Ballistix – *a futuristic ball-game certain to make its way onto the Match of the Day.*

BALLISTIX

PSYGNOSIS ■ ST & Amiga
£19.95 ■ Available end of April

A new goodie in the pipeline from Psygnosis is *Ballistix*, a weird ball-game crammed with eccentric game-play options. There are magnets which whip the balls away from you just as you go for a goal, splitters which divide up a ball and scatter the pieces across the playing area and arrows which drag the speed of play to superlight speeds. Lots of other oddities such as hoovers, blowers and bumpers span a massive 130 different pitches.



▲ *The latest addition to the Ghostbusters arsenal – Activision's* Real Ghostbusters.

REAL GHOST-BUSTERS

ACTIVISION ■ ST & Amiga
£19.95 ■ Out in May

OK, so the 8-bit game-of-the-series-of-the-film was a bit disappointing, but here's the real McCoy. If there's something weird in your neighbourhood; if there's something strange and it don't look good then guess what: your city has been over-run by an army of ghouls and ghosties threatening to wipe out all remnants of human life. You'll need to work your way through 12 different levels by zapping the ghosts and then netting them with your electron beam. At the end of each level there's a monster guardian ghost to be disposed of if you're going to find the key which gives you access to the next level.

Different screens include graveyards and swamps in a *Gauntlet* style, 8 way scrolling arena.

SHOCKS BOX

This month we've had standard adventure games courtesy of Microprose, weird adventure games, traditional shoot-em-ups, a ball game... and then *Populous*, a brilliantly indescribable release from Electronic Arts.

Into Salmonella Sam's Turkey Farm go a host of good games which just didn't make the grade. Codemasters had obviously retained Eddie Edwards as consultant for *Advanced Ski Simulator* on the Amiga – weirdly shaped characters tip-toed down the pistes like they'd never seen a ski in their life. Then there was Tomahawk's *Emanuelle* on the ST, a gambling game where the main objective is to relieve every female in sight of those cumbersome outer garments. (We might have reviewed this, but it mysteriously disappeared one night.) US Gold's *Human Killer Machine* was an average street-fighting game which suffered for being so easy that even a one-legged armadillo could mug everyone in sight.

Solution's *Prison*, yet another street-fighting game, definitely gave us all some of the very best laughs. We spoke to the programming team and they didn't even know what computer the game was written on – nice to know they understand the computer scene.

On the better side, Microdeal's *Slipstream* for the Amiga offered some really brilliant visuals in a flying game based around the film of the same name, but was just far too slow in the end. *Barbarian II* also made it into the Format offices this month but, despite a vastly improved gameplay and great graphics, it was outdone by all the other superb releases.

So, the games that did make it are certainly some of the best releases so far. New Amiga games in this month out-numbered ST releases by almost two to one – it looks as though the Amiga's superior graphics and sound capabilities are at long last winning it the battle for leadership of the 16-bit games market.

BLOOD MONEY

Psygnosis ■ ST and Amiga ■ £19.95 ■ Due May
(Amiga first, ST close behind)

Psygnosis are largely regarded as the leaders in the field of shoot-em-ups, having already released the hugely popular *Menace* and *Baal*. *Blood* is very much in the same vein with the objective, as ever, being to blast everything in sight. Previews of the screen shots look astonishing – we can't wait to see the full version.

BATTLETECH

ACTIVISION ■ ST & Amiga
£29.99 ■ Available in May

From the Infocom stable comes this new role-playing adventure game which sees you assuming the character of Jason Youngblood, a warrior cadet who must preserve his planet, his honour and his life. That's a lot for one person to be lumbered with, but providing you don't suffer a nervous breakdown first then you should manage it. The main selling point of the game is the Arena – a gladiatorial module which you can play in order to increase your skills and accumulate supplies.

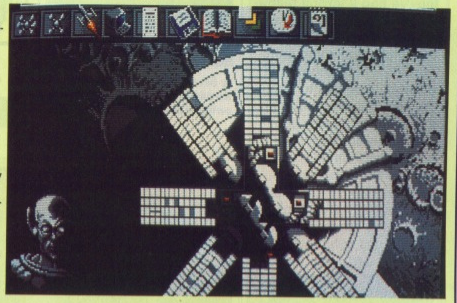
Battletech claims to feature the largest role-playing game environment ever created, spanning a mind-boggling four million locations.

MILLENIUM 2.2

Activision ■ ST and Amiga ■ £19.95 ■ April release

The year is 2200, Earth is uninhabitable after collision with an asteroid. You've been left on the Moon and must transform Earth into a habitable condition using whatever methods necessary. Your resources include a liberal scattering of research labs, mining facilities and a small generator. The only way of ensuring Earth's future is to build a spacecraft but time is short.

The game aims to combine tactical strategy, 3D arcade action and a host of puzzles to solve.



AIRBORNE RANGER

MICROPROSE ■ ST & Amiga
£24.95 ■ ST in April, Amiga following later

This 'action-strategy' game features a total of 12 separate missions across arctic, desert and temperate climes. You assume the demanding role of the lone Airborne Ranger who must complete each mission by packing the necessary supplies into three supply canisters. These need to be dropped at tactically advantageous points over enemy soil. Then it's into your Osprey aircraft for a parachute descent into the unknown.

When you get onto the ground you need to dodge all your bullet-mad enemies in order to reach your pick up point and return to safety. If other versions are anything to go by, this one looks sure to feature quality graphics, sound and addictive gameplay.

▲ *'I wanna be your Drill Instructor'* **Airborne Ranger** *finally finds its way onto the ST and Amiga*

OUTRUN EUROPA

US GOLD ■ ST & Amiga
£19.95 ■ Out in June

After all the hype, when the original version of *Outrun* was released last year it shot straight into the number one position. However, it was severely criticised for some considerable problems in scrolling and general movement. These, claim Probe software, the programmers of Outrun, have largely been resolved in this new variation on the game.

Here you take your Testarossa across different areas of Europe, driving through such detailed backgrounds as France, Switzerland, Italy and West Germany. Rain, snow and fog are all additional extras intended to upset your progress through the many levels.

VIGILANTE

US GOLD ■ ST & Amiga
£19.95 ■ Out in June

Guardian Angels, move over! Mob rule is in, and it's your job as a red-beret vigilante to defend your people's turf. Besides general mayhem, the gangs have kidnapped Madonna; most people would say let them keep her but this game assumes you actually want to rescue her – *really* mad! In this new street-fighting game you have to combat marauding groups of skinheads across a whole range of downtown locations from bridges to junkyards – all cutely picturesque! The game concludes with a spectacular fight on the top of a crane.

ACTION STATIONS

Don't just sit there, get stuck into this month's rip-roaring reviews

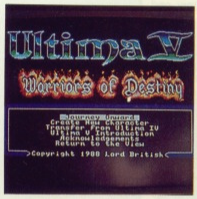
FORMAT GOLD

Ultima V	**Microprose**	**68**
Is Ultima the ultimate adventure?		
Populous	**Electronic Arts**	**72**
How To Be God, part 1		

REVIEWED

Cybernoid II	**Hewson**	**76**
Denaris	**Rainbow Arts/US Gold**	**81**
Titan	**Titus**	**82**
Zak McKracken	**Lucas Film/US Gold**	**84**
Silkworm	**Sales Curve**	**86**

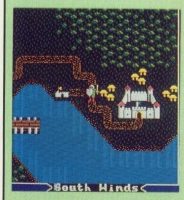
The *Ultima* adventure series has been around for years now and they've had a strong following in the adventure/role playing arena. In this latest game you guide yet another party of adventurers on a series of quests to save the world, destroy evil and generally persecute poor innocent trolls who want nothing more than a quiet life and the occasional tasty adventurer to keep them at their peak. Pick up your trusty sword, don your armour and light your torch for a trip into the underworld of *Ultima V, Warriors of Destiny*.



▲ *Ultima V, Warriors of Destiny.*

INTERACTION

Control of your party of adventurers is achieved by means of single key presses. Spell casting often requires two or three presses but most options are fairly easy to remember since the first letter of a command is often used. A quick reference card is supplied to refresh your memory when necessary. Movement around Britannia is simplicity itself, just use the cursor keys to go north, south, east and west.



▲ *Before you begin you must create a party of brave adventurers, willing to take on the awesome challenge of saving the kingdom.*

▲ *Generating your character is accomplished by answering a series of questions.*

FORMAT GOLD

ULT

MICROPROSE

ST – Keyboard. Reviewed. £24.9

▶ *In the heat of battle. The combat mode offers considerable choice in the formation of men so winning a battle can be made easier by withdrawing injured troops and replacing them with fitter men.*

AIM

The Kingdom of Britannia is ruled by the benevolent sovereign Lord British (OK, so the names are tacky). Recently the 'Underworld' was discovered and, drawn by curiosity, Lord British set forth on an expedition to discover its innermost secrets. Unfortunately he didn't return from the expedition and so Blackthorn took control of the throne of Britannia and, in true Botha style, imposed martial law to keep the peace. The objective is to ensure that Lord British is returned to the throne and all his evil allies defeated.

◀ *Power has been known to corrupt great men and Blackthorn was no exception. He turned from a tolerable ruler to an evil dictator, eventually aided by shadowy lords of evil who want to dominate the world.*

Ultima begins with a trip to the gypsy who asks you all sorts of questions designed to test your morality. During the game your responses will affect how other characters react to you.

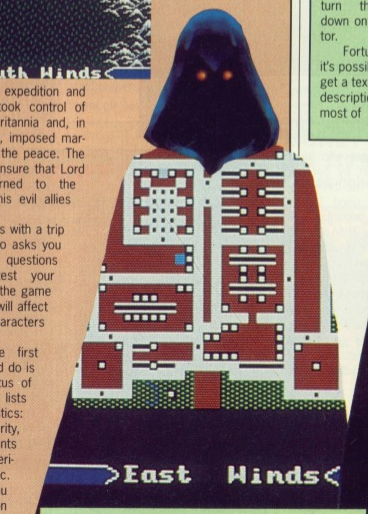
One of the first things you should do is to view the status of your party. This lists seven statistics: strength, dexterity, hit points, hit points maximum, experience and magic. These provide you with details on everything from your power (which can be advantageous when you engage in a battle) to the number of hit points you can sustain. Experience is gained as you progress through the game and comes in useful when you want to exploit the benefits of magic – more of that later.

GRAPHIC

The graphics are bright and colo but lack detail in the game itse The opening sequence however contains some very good pictures, it's just a pity that there hasn't been more attention paid to game graphics. Sprite animation wouldn't set the world alight especially since characters are so small you can lose them altogether if you turn the brightness down on your monitor.

Fortunately it's possible to get a text description of most of

hat's ve



▲ *A map of a castle called up after looking into a crystal ball.*

TIMA V

d. £24.95.

Amiga – Out at the end of April.

The dark forms close in around you. At your feet a body lies motionless. Above it, a figure draws an axe. Without warning, the amulet, lighting up your hand, emits a bright blue glow. Throw caution to the wind as the Gheldwards shriek back. The shiny shadows rise a notch and fade back into the inky darkness from whence they came.

▲ *A dreadful evil surrounds the opening sequence. One of many screens to fill you in on the scenario.*

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e choice in
winning a
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nd replac-

APHICS AND SOUND

t and colourful what's going on and that can make life
game itself. very much easier.
e however Tunes appear during game-
ood pic- play with one playing on the
at there main map, another in town
ention and yet another in battle.
hics. There are sixteen tunes alto-
ldn't gether, and these alter
spe- when you move around the
are playing area or engage in
e combat. They may not be the most imaginative pieces of music ever devised, but at least they vary and you're unlikely to be driven nuts.

STRATEGY

Ultima is played on three levels: countryside, buildings and combat. With the countryside display your party is represented by a single character who moves under cursor control. Monsters are shown as single characters and if you're not in the mood for being hacked to death you can always try and outrun them. If you come across a building or village then you can venture inside at which point the display switches to a building map. In this mode you can interact with people and objects but if you do anything wrong then you'll end up fighting for your life. This is where the combat mode comes in.

Combat routines are extremely flexible, giving you opportunities to change battle formation during fights or retreat the wounded and replace them with healthy characters. When your foes are approaching, you can use your missile-armed characters to attack and then switch to stronger melee characters for close combat. This helps to weaken your foes and can improve your chances of survival. As with all fantasy games there's the usual range of mysterious spells and, just to preserve tradition, there are eight different spell levels which may be cast by spending magic points. Ingredients are required and should be mixed beforehand because there's insufficient time during battle.

▶ *Wandering the streets of a typical Ultima village.*

Although violent meetings are dangerous they can also be very profitable. Monsters have always been known to hoard treasure and the ones in *Ultima* are no exception. The problem here is that the more treasure a monster gets his grubby claws onto, the tougher he becomes.

Detailed descriptions of your friendly neighbourhood monsters are available inside "The Book of Lore" which is supplied with the game and also contains a great deal of other useful information designed to get you started on your adventure. In addition, there's also a diary record from the fateful expedition of Lord British and a cloth map of Britannia. Not only does the map come in handy for drying up your cups but it's useful as well.

▲ *The tricky art of mixing spell components.*

CONCLUSION

Ultima V is not a game that you'll pick up and complete in ten minutes flat because it's designed for people prepared to indulge in sustained playing. As such there are options to save your statistics and location onto disk and continue playing again later. The area of this version is roughly twice the size of that in *Ultima IV* and if you've played the previous adventure then you can take characters from one game and import them into here. This feature has been part of the entire *Ultima* series

▲ *Exploring a castle roof top.*

and for avid adventurers, it's excellent. Even if you do complete the game once then you're not guaranteed to be able to do so again, the combat helps make sure of that, and no two games are identical. It's debatable whether it's a true role playing game or but it's definitely the closest thing yet.

Gary Barrett

▲ *The spoils of battle, a chest.*

stills 0 1 2 3 4 5

animation 0 1 2 3 4 5

soundtrack 0 1 2 3 4 5

lasting interest 0 1 2 3 4 5

overall 86%

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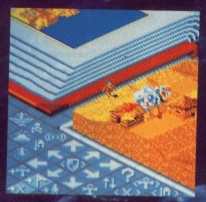
REVIEW

POP

When God sits up there dishing out his judgements there's not an awful lot you can do about it. Prayers are a bit old fashioned these days, and it can be hell to get the Royal Mail to deliver a note Up There. But now EA have released *Populous*, you've got the opportunity to change all of that. And just to prove its pedigree, it's written by the Bullfrog guys who were responsible for the legendary *Fusion*.

▲ And then God created land.



FORMAT GOLD

ELECTRONIC ARTS

Amiga – Mouse. £24.95. Reviewed.

GRAPHICS AND SOUND

Graphically, the game has been very well designed. You view an open book which displays the map as well as a close-up section of specified areas. Dots on the main map indicate the followers of good and evil which gives an idea as to the strength of your followers. Near to this is a sliding scale which moves up during the gameplay to inform you what kind of divine powers you can summon, such as earthquakes and floods.

Raising and lowering land looks effective and there's no problem in distinguishing different levels. The followers aren't brilliantly drawn and lowering the land underneath a house causes it to disappear rather than crumble to the floor. This drastic feat looks rather abrupt with divine interventions – earthquakes prompt a minor rumble and then everything vanishes. In the case of floods you look in horror as everything shivers and then almost the entire map disappears into the ocean.

Sound effects are brilliant. A mystic chanting takes place in the background which is very atmospheric. Additionally there are a small range of spot effects which appear when you unleash an earthquake or flood. An unconvincing clanking like a blacksmith at work indicates a sword fight, and you can then visit the scene of combat.

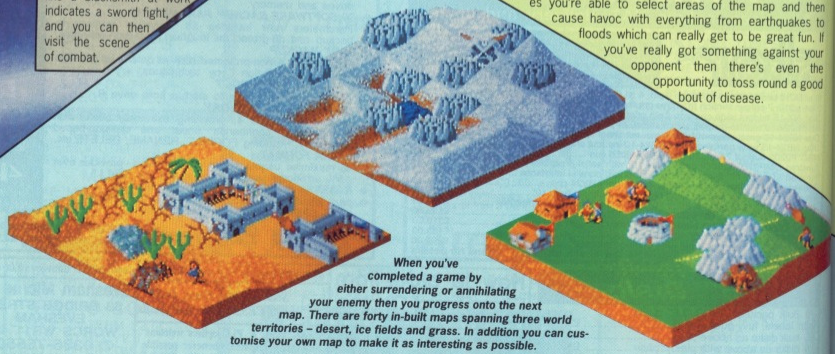
▲ *Placing a swamp can give astonishing results but if you invoke a flood you can radically alter the entire map. Unfortunately you can suffer pretty badly as well. Half the landscape can be wiped out.*

AIM

You need to decide to play the role of one of two divine beings, either God or the Devil. The idea is to thrash your opponent by manipulating your dedicated acolytes into collision with the enemy. The playing area is a scrolling landscape, and you've got to build houses for your followers to, um, (how do you put this delicately?) procreate in, before the opposition grabs them. Your power increases to celestial proportions as you gain followers. With your opponent trying to do exactly the same thing on the opposite side of the map you soon realise that one world just isn't big enough for the two of you.

Followers can only build their homes on flat ground so you need to use the mouse to select areas of landscape and either raise or lower it until it's levelled. Your people will then come along and build on the land; first small dwellings barely large enough to pray in and then a decent sized home. Followers will disappear into these places and do whatever followers do, whereupon several new members appear out of the front door. If all the land around the house has been levelled then a castle will be erected.

This might seem like fairly basic stuff but where things really hot up is when you start employing a bit of divine intervention to whip the other side's houses for yourself. As your power increases you're able to select areas of the map and then cause havoc with everything from earthquakes to floods which can really get to be great fun. If you've really got something against your opponent then there's even the opportunity to toss round a good bout of disease.



When you've completed a game by either surrendering or annihilating your enemy then you progress onto the next map. There are forty in-built maps spanning three world territories – desert, ice fields and grass. In addition you can customise your own map to make it as interesting as possible.

PULOUS

ST – Available mid-April.

stills 0 1 2 3 4 5

animation 0 1 2 3 4 5

soundtrack 0 1 2 3 4 5

lasting interest 0 1 2 3 4 5

overall 92%

▲ *Depositing the Papal magnet.*

AIM

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STRATEGY

At the start you must place a papal magnet somewhere on the map. You can then pick a leader and instruct him to go towards it, taking all your followers with him. He'll venture on, finding new territories and relying on you to flatten the land for him.

The game works by selecting somewhere to go on the main map at which point you're presented with a detailed view of this section. Although it's easy enough to view the land on your territory you cannot venture into the domain of your other half.

When the game has progressed this far you can start to engage in all manner of scurrilous activities. You can instruct your followers to engage in fights with the opposition wherever possible – this only has any effect when you come across an enemy occupied house. The owner will emerge and you will fight to the death. Should the house occupier lose then his house will be burnt down.

Making use of the range of divine effects which include earthquakes, floods, disease and even armageddon is fine but unfortunately your enemy has a tendency to play dirty and use the same disasters on you. By viewing his territory you can decide which are his most heavily built up areas and then ruin his day by invoking a volcano. It's the floods which can really cause problems – all ill-advised deluge will not only obliterate most of your enemy's territory but you can also kiss goodbye to a large extent of your own land. The entire outcome of the game can be changed with this kind of global effect.

▲ *You may be called to battle against your opposite half. The loser has his house petrol-bombed so it's worth watching even though you don't have much say in the outcome.*

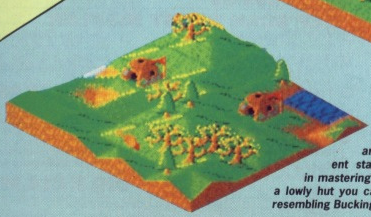
CONCLUSION

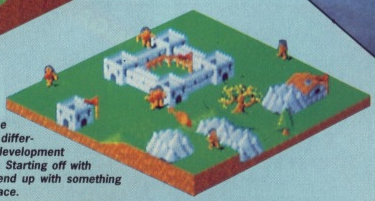
Populous is a strategy game but at the same time the action progresses fast enough to grip even the faithful shoot-em-up addict. A typical game can take around an hour to play but by selecting different aggression and rate levels from a menu you can alter this to suit your requirements. These allow you to specify what options can be brought into play, such as shallow or bottomless swamps, build up and down or up only. These will affect both players but further menus can restrict each player individually so, for example, floods cannot be used by the Devil or God can't let an earthquake rip.

Populous is an excellent game – graphically exciting and amazingly addictive. It's one of those games which you just can't leave alone. Even the front screen, where you'll spend most of your time, is unusual enough to keep you intrigued. As well as a demo mode where you can pick up strategy hints, your opponent can be another human connected via a modem link. The advantage of this is that you can find an opponent from miles away or assemble a simple lead for another machine just inches from your prized Amiga.

The only real criticism of *Populous* is that impatient ST owners have to wait several more weeks to get their hands on this divine release.

Mark Higham





There are three different stages of development in mastering the land. Starting off with a lowly hut you can soon end up with something resembling Buckingham Palace.

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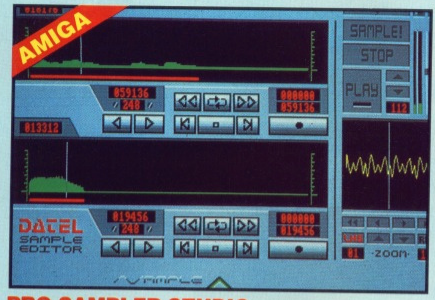

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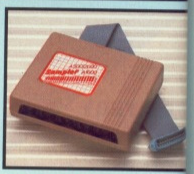

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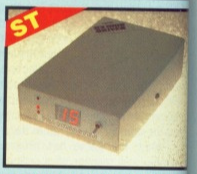

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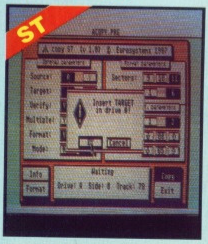

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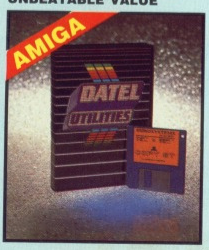

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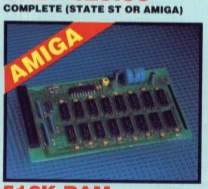

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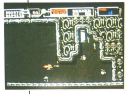
REVIEW

CYBERNOID II

HEWSON

ST – Joystick and keyboard. £19.95. Reviewed Amiga – £19.95.



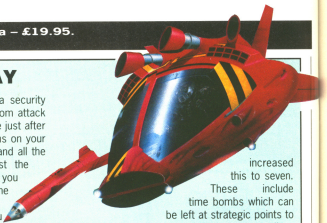
Under the cloak of night, when the bats come out of their hiding places and man finishes pulling the gunge out his earhole and buries his head under a feathered cushion, *Cybernoid* comes out of it's hole to protect the world. *Cybernoid II – The Revenge* is the sequel to the classic *Cybernoid*, rightly famed for its brilliant graphics.

GAMEPLAY

The Federation have recruited you as a security guard to protect their storage depots from attack by pirates. It wouldn't matter if they were just after your body but these pirates have designs on your latest valuable minerals, jewels, ammo and all the best battle weaponry. When you blast the pirate ships they'll drop their cargo and you must then manoeuvre your ship over the top of it in order to reap the benefits.

Some of these objects will offer you external weaponry which can change the appearance of your Cybernoid ship and come in extremely useful on the tougher screens. Collaring the occasional pirate craft which drops off a yellow canister is a major bonus since it increases your amount of weaponry by one.

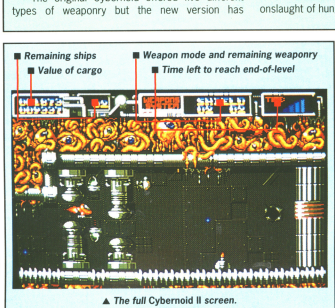
The original Cybernoid offered five different types of weaponry but the new version has increased this to seven. These include time bombs which can be left at strategic points to explode a few seconds after release, as well as seeker missiles, great for leaping around the playing area and destroying your quarry. The Tracer weapon is great fun – it darts around the edge of the screen wiping out all the emplacements in its path. As ever, most useful are the defence shields which come in handy when you're facing an onslaught of hungry missiles.



GRAPHICS AND SOUND

The graphics of the original *Cybernoid* were always regarded as some of the flashiest ever and *Cybernoid II* has gone even better. There are no massive sprites but the expanse of colour used in the weapons is what makes it graphically exciting. Scattered missiles move around the screen at pretty fast speeds and in a range of bright colours. There are a lot more obstacles included in this version which combine to make things harder. Roving space blobs and rockets seem set to put an end to your activities.

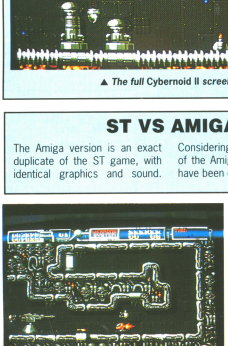
A simple musical tune plays during the game but thankfully there's an option to turn this off. Sound effects aren't particularly inspired and appear every time you fire a missile or get hit.



▲ *The full* Cybernoid II *screen.*

ST VS AMIGA

The Amiga version is an exact duplicate of the ST game, with identical graphics and sound. Considering the extra features of the Amiga a bit more should have been done.

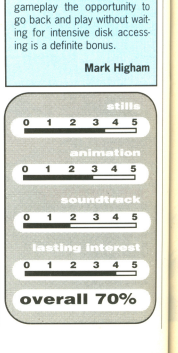


◀ *The full* Cybernoid *screen. The objective hasn't changed from the original version – you still have to protect the Federation base, but you've got a whole load more firepower to do it with.*

CONCLUSION

With better graphics and access to a far wider range of weaponry, *Cybernoid II* has become a considerable improvement on its forefather. However, the gameplay remains identical, if more difficult. What's good is the way that once a level has been loaded no other demands are made on the disk drive. Consequently you cannot save your hard-earned high-scores, but with this type of addictive gameplay the opportunity to go back and play without waiting for intensive disk accessing is a definite bonus.

Mark Higham



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GAME BUSTERS

TIPS

Is life getting you down? Is the end nigh? Do you spend most of your time sitting in wreckage and exploding on screen? If the answers to any of these questions is yes, you need a dose of pokes and tips courtesy of your caring, sharing ST/Amiga Format.

SWORD OF SODAN

Amiga

If you're having trouble completing the Format Gold from last issue then you might find these tips invaluable.

1. Start the game as normal, choose your character and start on the first level.
2. Get yourself killed on level one.
3. The high score table asks if you want to replay or start a new game. Select the later option.
4. Choose the same character as last time and keep pressing return until level one has loaded.
5. Press return once more and an exclamation mark appears over the place where your lives should be. You now have infinite lives.
6. If you press the return key again you'll go to the next level.
7. The process can be repeated up to the final level, so you can easily complete the game.

Andrew Harbottle
Newcastle-upon-Tyne

THE F-16 FIGHTER SIMULATION

FALCON

Amiga

After taking off, your waypoint for your mission is selected. Press A to engage autopilot and your F16 will head towards your desired target. To go one stage further engage constant autofly below 500ft. Switch the radar off and kick in your afterburners. If Migs start to track you, the autopilot will turn you around for a head to head.

Decrease thrust to military power, turn on the radar borescan mode. When the bogey is at two miles, squeeze off a burst of rounds and scratch one Mig.

If you take a well placed bullet or missile up your six then your engine flames out. Instead of bailing out, swing around and head for home. Press [Help] and [+] on the numeric pad and keeping them depressed. The F16 will stay level and drop down. Switch to tracking mode and rotate to a side view. Just before touch down, pitch up the nose and the plane will touch down successfully every time. Select end mission and you will be rescued even if in enemy territory.

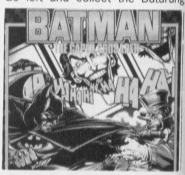
Angelo Tommaso
London

BATMAN

ST

The complete solution to the first scenario, 'Bird in the Hand'.

Go left and collect the Batarang



KINGS QUEST 4

ST

Here's a not so brief guide to the early stages of the game. Stay clear of the ogres house and nasty trees. As you wander around you'll see a bird tugging at a worm, get it and go to Lolotte's castle. Lolette will tell you to get the unicron.

Get the golden ball from under the bridge and then go to the pond with the frog (wearing a crown) on the lilly pad. Stand to the right of pond and throw the ball into it. The frog will retrieve the ball and sit by the pond. Get the frog and kiss it (ugghh!) and it turns into a, yes you guessed it, prince who gives you the crown. Pick up the ball again.

Go to the pillared pool and keep revisiting it until cupid appears. When he flies away get the bow and two arrows (don't mess with cupid, he can be a mean dude). Find the unicorn and shoot it once with the bow.

Go to the old house and get the book from the shelves in the left hand room. Look at the picture at the girl looking to the left. Pull the latch in the left wall and go into the secret stairway. At the bottom of the stairs you'll find a shovel which you should take. Play the organ if you must; you don't score anything for doing so.

Go to the meadows and you'll meet the minstrel. Give him the book. Take his lute and then go in search of Pan. Play the lute and he'll swap you for his flute. Go to the dwarves house and give it a good clean. They will leave some diamonds behind in gratitude which you should take (anyone know is these dwarves need a full time cleaner?).

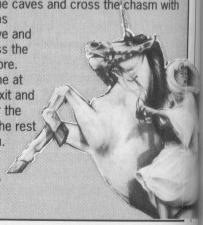
Head for the mines and give the diamonds back to the dwarf on the farthest right. Get the lantern and the diamonds. Head for the fishermans cottage and walk along the pier. Go back to his cottage and give him the diamonds; take the fishing pole. Go back to the end of the pier, put the worm on the hook and catch fish.

Go to the waterfall, wear the crown and turn into a frog (you handsome devil). Swim under the waterfall and get the board at the mouth of the caves. Light the lantern and then save the game.

Enter the caves and redo until you can get passed the troll (there are two routes). Save again. Find the chasm, probably by falling down it and put the board across the chasm, cross it and then get the board again. You will exit the caves in a swamp. Jump across the line of reed clumps. At the last clump before the island stop and put down the board.

On the edge of the island play the flute to mesmerize the cobra and quickly get the magic fruit. Walk back across the board and jump back over the reed clumps. Save again.

Enter the caves and cross the chasm with the board as before. Save and redo to pass the troll as before. Get the bone at the cave, exit and swim under the waterfall. The rest is up to you.



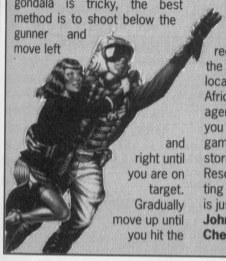
Ray Boff
Hillingdon,
Middlesex

ROCKET RANGER

Amiga

Try and rescue the professor as this slows down the Nazi's; they can't use him to increase their efficiency. You will waste valuable time unless you rescue him from the zeppelin while he is over the Atlantic.

Shooting the gunner in the gondala is tricky, the best method is to shoot below the gunner and move left and right until you are on target. Gradually move up until you hit the gondala. There will be a flash when you hit it. It's important that you stop firing now. After a few seconds have elapsed you'll be inside the gondala which is where the fun really begins. It takes lots of practice getting here, but it's worth perfecting.



The next thing to do is find a supply a Lunarium before the Fort Knox supplies run out. To do this you need to infiltrate the Nazi base which receives vital Lunarium from the Moon. The base can be located in South America or Africa. Once infiltrated, your agent there will carry on sending you Lunarium throughout the game. However, you will have to storm the Nazi base first. Rescuing the professor and getting hold of a Lunarium source is just about beginning...

John Chasey
Chesthunt, Herts

and then go down through the door and left. Collect the grenade, go right and collect the spanner. Use the spanner and drop it. Head right and get the key and badge.

Move left and then up. Pick up the disk and use it. Use the Batarang and leave the Batcave. Stand at the edge of the screen and throw the Batarang at the Penguin's men when they appear. They will eventually drop a packet of crisps which can be eaten when your health is low. Stop going left. Move right until you reach a door and use the key to open it. Drop the key and enter. Go left and through the end door. Pick up the magnet and walk right and through the door. Go right then down and through the first or second door. Head right until you reach the room captioned 'Shadows everywhere'. Walk through the door, go right and collect the food. Move left until you reach the dead end.

Use the grenade to blast

throwing and they'll run away.

When leaving the secret exit from the Batcave go left, collect the sweet and continue left. Pick up the trainers, go right and then climb onto the roof. Head right and collect the torch and return to street level. Go right until you get to the warehouse and then show the badge to the policeman when he appears. He'll let you continue.

Pick up the Batrope and climb onto the warehouse roof after

through the wall. Carry on left and go through the second door. Head left and then down through the door. The room will be captioned 'Getting you down'. Use the Batrope to go down and then get they lift key after going left. Return right and go through the door. Use the trainers now.

Move right, down right and collect a knife then go left and through the door using the torch. Go right, up and left and get the dart. Retrace your steps to the screen where you dropped in by rope. Use the lift key in the lift. Drop the lift key and torch. Go to the room where you used the grenade and use a dart from the dart board. A passcard will appear and you must pick it up. Leave the building and go to the mansion

Use the passcard to enter and then go left and up. Get the key and go down, right, right, up, left, up, left and up the stairs. Go right to the end of the corridor and down through the door. Pick up the video tape. Head left, down, right, down, right and up through the door. Go right and then through the large white door using the key and pick up the disk with 'Virus' written on it.

Go back through the white door, right and up through the larger white door. Head right and retrieve the trumpet. Go to the Penguin's computer and insert the virus disk. The computer is ruined and the Penguin's plan foiled.

Timothy Hodges
Peterborough, Cambs

RAMBO III

ST & Amiga

When you're in the second building always wear the infra red goggles. Never walk in front of the soldiers, otherwise the alarm will go off.

If you come to a dark room then use the glow tube. Never use a gun unless you have a silencer fitted to it. It might not seem too healthy but always turn off the electric door by walking into the switch on the wall. The mine detector will only work when you have located all parts of it. The infra red goggles only function properly when they have batteries. Never stand on the infra red beams which cross the floor otherwise the alarm will go off.

Andy Mullan
Bedford

DALEY THOMPSON'S OLYMPIC CHALLENGE

Amiga

To start on any event with 3 cans of Lucozade do the following. When the high score table appears type in HINGSEN-J and press [Del]. The high score will now have the heading "Demo". Type in –J and press [Del] again. The table will now be called "Mega-Demo". Press F1 to F10 to start on the relevant event with lots of fizzy stuff.

Paul Bennett
Reading

GIVE ME THE PRIZE

If you have some cunning cheats, powerful pokes or tantalizing tips for ST or Amiga games? If you do then don't be mean – share them with the rest of world by sending them to Game Busters. Not only would that show what a considerate and generous person you are, but there's the added advantage that the best tips or pokes of the month win a handful of the latest fabulous games. There's an ST and Amiga prize, so get writing. Send your tips to: Game Busters, ST/Amiga Format, 4 Queen Street, Bath BA1 1EJ.

This months winners are ANDREW HARBOTTLE for his Sword of Sodan tips and TIMOTHY HODGES for the Batman playing guide. Next month it could be you.

ST & AMIGA

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REVIEW

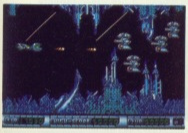
DENARIS

US GOLD

Amiga – Joystick. £24.95. Reviewed.

ST – No version planned at present.

Those galactic fiends are at it again. You give 'em just enough time to get over your last attack and what do they do? Repair their lasers and start shooting photons at you again. *Denaris*, previously named *Katakis*, is US Gold's answer to the hugely popular *R-Type*.



▲ *Venturing onto level two. As with the arcade classic, R-Type, you come across a host of weird creatures which you must defeat.*

GAMEPLAY

Between the ravages of out-of-control computers and the unfortunate effects of nuclear war, the planet Dinaris is in a fairly poor state.

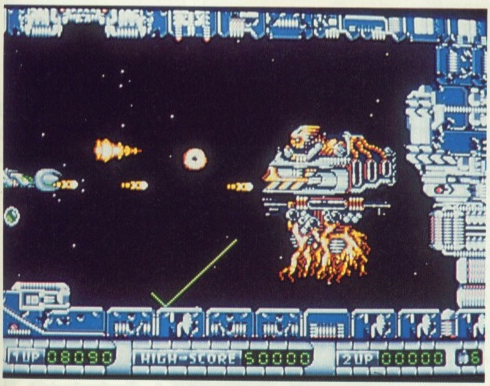
The idea is that you must fly over the confines of this over-powered planet and rid it of its robotic enemies. There's an advantage to this kind of vicarious extermination – lots of death without the blood.

It's a vertically scrolling shoot-em-up with enough enemies to make you wonder if you were really meant to be around. Besides blasting everything that moves and looks as ugly as a politician, you need to avoid the occasional indestructable missiles and pick up additional weaponry. These aren't just a bonus, they're an essential. Unless you're well-equipped you'll never get very far.

Weapons range from a scatter-shot which will fire several missiles with each tap of the fire-button, right up to a power-shot and multi-directional lasers. Besides these, there is a special attachment which will speed up gameplay. This might sound like a great idea but steering your ship around at faster speeds is not to be advised – you drop dead quicker than an armadillo in a gas chamber.

Towards the end of each level you encounter one super monster. He doesn't generally move around too quickly but he soaks up firepower like a sponge. You'll need to have acquired more than your fair share of weaponry to make an impression.

One of the best features of *Denaris* is the way you can retrieve weapons after resurrection. When you get killed you can start again in the middle of a level, provided you've progressed far enough. Both laser weapons and the good old power-shot appear almost instantly so you won't need to face an onslaught of ugly characters without the basic requirements of all space-explorers.



◀ *Eight lives are enough to get you as far as the end of level monsters which are scrolled very smoothly considering their size. On the bad side, they eat up so much fire-power you need to have acquired lots of special attachments if you're going to fill them with lead.*

GRAPHICS AND SOUND

Nobody would argue that the vertically scrolling shoot-em-up is addictive but it's such an old idea now that it takes a lot to make this type of game original.

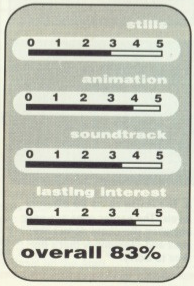
Where *Denaris* really excels is in the brilliance of its graphics. The scrolling is smooth, if a little slow at times. The huge number of different monsters which range from odd little astronaut heads to wandering robots have been superbly animated to such a degree that it gives you a warm glow watching them vanish in a puff of smoke. In addition, the end of level monsters are massive creatures which have been designed to look as menacing as possible.

Sound effects are also a cut above average. Besides good load-up music there's real arcade-quality sound effects with echoing phaser noises over the gentle purr of your craft.

CONCLUSION

There's been much controversy over *Denaris*' similarity to Activision's *R-Type*, and it's not unfounded. *Denaris* is almost identical to the *R-Type* arcade game. However, it's far superior to the ST conversion with better servings of well-defined graphics, smooth scrolling and a more sophisticated feel about the whole game. There's still an interminable wait between levels but the arcade action is as addictive as ever.

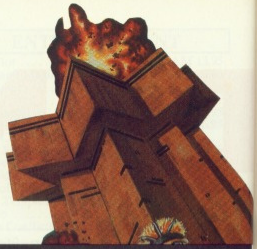
Mark Higham



REVIEW

TITAN

TITUS



ST – Joystick, mouse and keyboard. £19.99. Reviewed.

Amiga – Joystick, mouse and keyboard. £24.99.

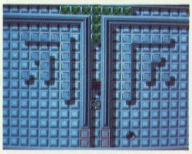
When you lie down does the room spin around you? Do you feel confused and aged? In that case you've either been knocking back a few too many Perrier waters at your local, or you've been playing *Titan* too long.

GRAPHICS AND SOUND

Astonishing visuals are what keep this game alive. It's amazing just how fast and how smoothly everything moves when you start trying to catch the ball.

Your bat is constantly in the centre of the screen and any movement causes the background to move around at lightning speeds. Since every backdrop is patterned, this quickly causes your eyes to bounce around their sockets like Superman's taken a snooker cue to them.

Sound effects aren't particularly great but in a game such as this there's not really a lot that can be done.



▲ *The action spans 80 different levels. The earlier ones are easy but when you come across the skull and crossbones that's the time to worry.*

▲ *There's a certain level of skill involved in learning to manipulate the ball. On some levels you encounter walls which can be destroyed by your racket. If you then direct the ball through the gap then you can watch as it single–handedly destroys everything in its path - brilliant!*

GAMEPLAY

Mr Hybris, who sounds like a character of dubious honesty, has been an enterprising fellow. You see, he decided that the average life expectancy of human beings was getting to be just too long. So he came up with the perfect idea, short of euthanasia, to rid the streets of all the wrinklies. He created a game which would drive everyone mad, and guess what? It worked.

The idea is that you've got to use your magnetic racket to direct a rebounding power-ball around the different levels, knocking out bricks. Sounds familiar? What prevents this game from repeating its *Breakout* ancestors is the brilliant scrolling techniques, the birds' eye view and a bevy of added extras.

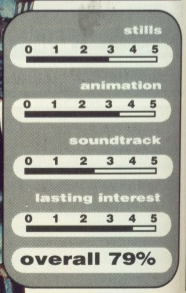
There are several icons scattered around the playing area. A moving skull and crossbones is the worst obstacle you're likely to encounter. If either the ball or your racket collides with these then the result is instant death. The Energizer is an odd fellow – meet it down a dark corner and it'll cause your racket to switch positions with the ball. An amusing feat when you're trying to catch the ball as it fires around the screen about to hit one of the dreaded skulls.

As with most of the *Titan* enviroment, it will take some fast action but it's all great fun.

CONCLUSION

Titan is the kind of game which has you reaching for the Optrex after an hour – and that's got to be good. It's very much in the *Breakout* vein. Some of the levels are ridiculously easy but this is more than compensated for by impossible screens incorporating the menacing skull and crossbones. Thankfully, eight lives give you enough opportunities to delve into the 80 different levels. Stunning, super-fast graphics make this one so addictive your eyes'll turn into spinning, kaleidoscopic squash balls.

Mark Higham



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Is the world's population becoming stupid? Why are squirrels getting mean and growing spare heads? Are we world being invaded by aliens? Will Zak find his true love, or have to live with Sushi the goldfish forever? All these questions and more are posed in Lucasfilm's new game. Whether you get to answer them depends on whether the alien mindbenders twist your brain first.

▲ *The smallest room on the plane.*

◀ *Zak is an adventure with inputs taken by clicking at on-screen locations or selecting from a set of actions.*

ZAK McKRACKEN

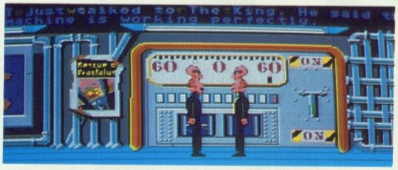
and the Alien Mindbenders

LUCASFILM/US GOLD

ST – £24.99. Mouse and Keyboard. Reviewed. **Amiga – Out Now. £24.99.**

ST VS AMIGA

There is no difference at all between the ST and Amiga versions as far as graphics and sound are concerned. However, the ST version is supplied on three disks as opposed to the Amiga's two disk game. Consequently the Amiga version requires far fewer disk swaps during play.



▲ *The aliens seem to have gone insane already. You can come to this secret room if things get dull – these guys are certain to provide a laugh.*

GAMEPLAY

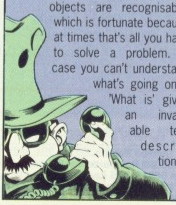
Zak McKracken is a roving reporter from the *National Inquisitor*, a typical kind of Fleet Street paper which would rather make up stories than report the truth. Zak wants to win a *Pullitzer* prize but knows he won't get one writing for the *Inquisitor*. So he agrees to take on one more assignment before leaving to write a novel. He's sent to investigate a bi-cephalus squirrel and delve into a spaceship story. Little does he know he's heading into an alien plot to make the world look stupid.

The action takes place across various parts of the world, all of which can be reached by plane. Occasionally the scene switches to "A secret room" where aliens are executing their dastardly plot. Apart from letting you know what's happening their activities provide some light relief.

You begin in your bedroom and must find objects and solve puzzles in true adventure style. As the game goes on three other characters emerge: Annie, Leslie and Melissa. Using these four heroes and heroines you have to rescue the world from stupidity.

GRAPHICS AND SOUND

The scenery is fairly colourful and objects are recognisable, which is fortunate because at times that's all you have to solve a problem. In case you can't understand what's going on a 'What is' gives an invaluable text description.



Animation isn't brilliant – Zak and the crew walk stiffly and even Sushi, the goldfish, swims jerkily around her bowl. Fortunately this doesn't matter too much since it's an adventure and animation is less important.

Sound effects are fairly simple things such as running water, garbage disposals, ticking clocks and footsteps. Nothing spectacularly mind blowing, but they serve their purpose.

CONCLUSION

Zak is a change from standard text-entry adventures, offering problems which can be solved using some good, old-fashioned lateral thinking.

What slows down progress is the speed at which you move. In a conventional adventure you can zoom across locations once you know the way, but learning the route here doesn't speed things up at all. But it's a great game, providing hours of fun.

Gary Barrett

stills 0 1 2 3 4 5

animation 0 1 2 3 4 5

soundtrack 0 1 2 3 4 5

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overall 71%

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REVIEW

SILKWORM

SALES CURVE

ST – Joystick or keyboard. £19.95. Available mid-April. Reviewed.

Amiga – Joystick or keyboard. Available mid-April.

It's not true! Even after months of negotiation with the Ruskies and despite a mass exodus out of Afghanistan, we're still under threat. However, now that there's no one around to press the Nuke button, the battle arena has switched to copters and planes. Aside from a few improvements, *Silkworm* is a direct conversion from the arcade machine.

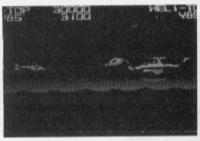
GAMEPLAY

The objective is to survive a blitz of helicopters, paratroopers and jets long enough to reach the end of a level where your sanity is thrown into question by the apparition of a missile-firing goose.

You fly through several landscapes in the guise of either a helicopter or a jeep. The helicopter is the most versatile, but comes under considerable attention from hungry missiles. If you choose to play with a friend then both helicopter and jeep participate.

This is no easy challenge; even the initial levels are so over-populated with missiles and offending aircraft that it's difficult to survive long enough to get to see the end-of-level craft. Your mission is made easier with multi-directional firepower, and is improved further by destroying the weird goose.

By shooting at ground stations it's possible to release a protective shield which vaguely resembles fairy dust. Once inside this cloud you're safe from attack until it disappears. If you manage to call up two such shields then these will act as a smart-bomb and destroy everything on screen. Great for all of two seconds.

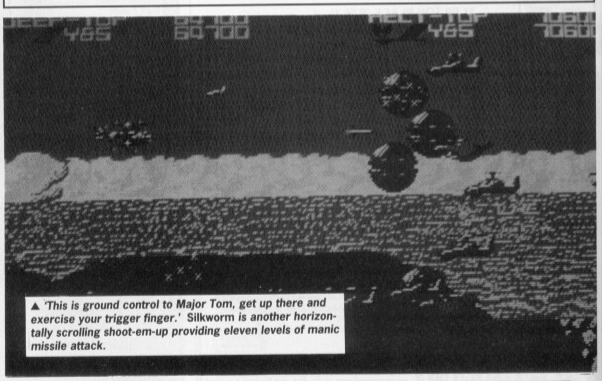


▲ *The odd goose gives you twice as much fire-power but you need to detroy it first.*

GRAPHICS AND SOUND

The basic *Silkworm* game is made of a multitude of different sprites, ranging from a selection of helicopters and tanks right through to super fast jets. Because of all the action taking place on each screen, the majority of sprites are fairly small and, as such, far from impressive. However, they've been animated well with revolving blades and smooth movement. It's the end of level obstacles which are graphically most pleasing. Large, well-drawn tanks and a massive animated helicopter make up some good moments. Sound effects have been designed so that when you fire at an enemy you get an audible idea of when it's about to explode – brilliant because the opposition take many hits. It's the only way you know whether to risk those last few shots or avoid the approaching missile.

Backdrops are reasonably impressive although they have a tendency to become dark. A feature in this area is the addition of the occasional burst of fractal lightening which is particularly prevalent in one level.



▲ *'This is ground control to Major Tom, get up there and exercise your trigger finger.'* **Silkworm** *is another horizontally scrolling shoot-em-up providing eleven levels of manic missile attack.*

CONCLUSION

The original obscure arcade game featured no specific ending – probably because the makers thought nobody would get there. You face similar adversaries in the computer version, but if you can to survive to the end then there's been a whole new finale added. It's a spectacular conclusion with the whole screen leaping up and down and then crumbling to the floor.

For all it's action and attention to detail, *Silkworm* is still just another shoot-em-up. At a cursory glance, the helicopter scenario might appear impressive but it's no match for the likes of *R-Type* and *Denaris*. Animated sprites aren't large enough and the later levels are so ridiculously hard that long-term interest doesn't last. However, if you were attracted by the arcade game then this is a good enough conversion to warrant picking up your stick.

Mark Higham

stills 0 1 2 3 4 5

animation 0 1 2 3 4 5

soundtrack 0 1 2 3 4 5

lasting interest 0 1 2 3 4 5

overall 70%

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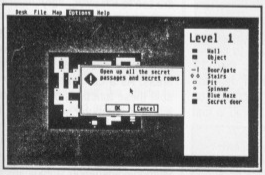

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GRAPHICS

WHO DIGITISED ROGER RABBIT?

Traditional art packages are passé – making your pictures move is the name of the game nowadays. But what do all the fancy animation packages do? MARK PICAVANCE begins a new series to show you how to produce convincing 3D animated graphics, using everything from simple paint packages up.

GOLDEN RULES

The following points should always be kept in mind if you wish to improve your animating skills and to impress others with what you can do.

- **Always create a 'storyboard' (a plan) before embarking on a serious animation. A little planning avoids wasting time and effort later.**
- **All natural motion occurs in arcs – only boring things move in straight lines.**
- **Create all your 'key' images first, don't try 'straight line' animation (draw the animation in the order it is to be viewed).**
- **Details and colour should be secondary considerations to getting the movement right.**
- **Don't be over ambitious. It's easy to be put off by attempting something complicated early on.**

RABBIT REVELATIONS

Richard Williams is the animator responsible for *Roger Rabbit* and friends. Without doubt he is the single most important figure in conventional animation today. Richard uses many special techniques to give his animation a unique look and style. One of these involves shooting the frames on what is called a 'three frame mix'. Each film frame has the animation frame designated to it, an after-image from the previous frame and a pre-image from the one that follows. This makes the animation look very smooth, but it also turns a simple rostrum camera shoot into a nightmare. Richard tempers his artistic genius by having his own Jazz quartet.

Over this and the next three issues, we're going to remove the mystery from creating moving computer graphics. Topics covered will include grand-sounding themes like 2D motion, character animation, vector graphics, ray tracing, special effects and advice on the software for creating animation.

To begin though, here's a potted theory of the process:

Ani'mate *v.t. breathe life into; –ed a. lively, vivacious; (cine., of drawings etc.) having apparent motion.* This dictionary definition is succinct, but gives no clues as to what is being attempted. The key phrase is 'having apparent motion'. In short this sums up all animation.

To create motion it is necessary to construct an illusion of moving images from still images. Each still graphic is referred to as a 'frame'. The rate at which frames must proceed each other to create smooth movement is about 24 per second. This is based on the number of 35mm projected frames per second that you will see when you visit the cinema. In Britain the television system displays 50 frames per second; this means that when a cinema film is shown on TV, each frame is displayed twice ('on doubles', as it is called) and the overall speed of the film is increased to make up the extra two frames. Does that mean you've got to draw 24 images for every second of film (that's 1480 per minute)? Thankfully, no. Most conventional animation is drawn at 12 frames per second and each frame is 'held' or shot twice when transferred to film.

In some situations less than 12 drawings are needed; it all depends on how much motion is occurring on screen. A simple rule of thumb is that large movements require more frames than small movements. Images don't flow smoothly if there are too few frames. Very undesirable!

Who does what?

In an animation studio the job of creating films is broken into specialised areas. As a computer animator you'll split these functions between yourself and the computer – if you do it correctly, the computer should end up with all the boring jobs (*that's what I call delegation – Ed*). The jobs in conventional animation studios are:

Director – he initialises and controls the whole process. This enables him to annoy animators by rubbishing sequences of animation that may have taken hours to produce. He also creates the 'storyboard' from which the animators construct the action and take their timings.

Editor – together with the director this person takes short sequences of animation and combines them into a finished film. In animated films, as a rule, little is com-

THE MAKING OF SNOW WHITE

The scale of effort involved in creating lengthy animation sequences using conventional techniques is difficult to comprehend.

A Disney feature can be classed as a large scale animation. When Walt Disney created the first full length feature in 1937, Snow White, it took over four years and required the skills of nearly 1200 people. In addition it almost bankrupted Disney. The artists involved produced some 180,000 individual drawings and, in the process, exploded animation techniques into a new dimension. To give the animator's 'draw lines' a distinct feel, the drawings were not traced with a pen but with a fine brush. This resulted in a smooth line which changed thickness gradually. Paint was used in such large amounts that colour matching became a problem. The solution was to have each colour produced in very large amounts. A typical container for a single colour held 40 gallons. The Disney engineers – not content with the conventional rostrum – created the 'multiplane', a monster camera mounted in a 40-foot tower. It required five operators to use it, one of whom was suspended on wires within the tower.

▲ *Picture title: In the dark with computer animation? Created by Mark Picavance using Sculpt 3D and touched up with Photon Paint. The ray-trace took 4 hours.*

pletely cut. All the best arguments are between the editor and director.

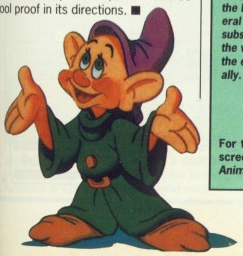
Animator – the primary function of the animator is to sketch 'keys', the essential frames which describe what happens. He produces one or two for every second of film time; more if the animation is complicated. He also numbers and marks his drawings to help the inbetweener, the next man in the chain of events. In general, animators temper their creative genius by drinking too much.

Mere minions

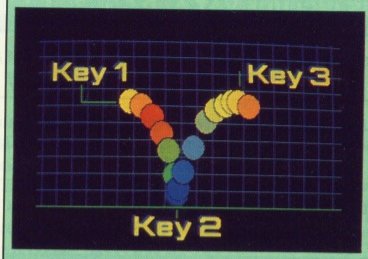
Inbetweener – in some ways his task is as creative as the animator's. He deciphers the scribbles made by them on their keys and endeavours to generate the drawings that go between them. The ability to copy an animator's drawing style is vital. A poor inbetweener can make a potentially excellent piece of animation look jerky. The reverse is also often true. Some animators refuse to allow anybody to in between their animation. Inbetweeners moan because animators take all the glory if a film is good.

Trace and paint – the original drawings which make up an animation are created on thin paper so that several frames can be seen if they are overlayed and a light is placed behind them. For the animation to be filmed it must be traced onto a sheet of cellulose, called a 'cel'. The trace and opaque work is usually done by the same people. Once traced, the cel must be painted. The paint must be applied evenly. Some people find this harder than animating. Trace and paint is generally done by people who have no idea what's going on, and no real desire to either. The rumour goes that some of the T and P guys working on *Watership Down* believed that the film was about donkeys. They got quite a shock when they saw the film.

Rostrum camera – after the animation has been directed, animated, tweened, traced, and painted, it is handed to the rostrum camera man who must shoot the combined artwork onto film. The 'rostrum' is a platform on which the animation is placed to be shot one frame at a time. Its special features include the ability to move the camera and artwork to simulate live-action 'pans' and 'zooms'. To aid him in his objective, the camera man is given a detailed description of the shooting of every frame. This is called the 'dope' sheet, and should be fool proof in its directions. ■

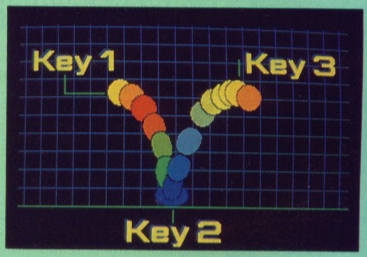


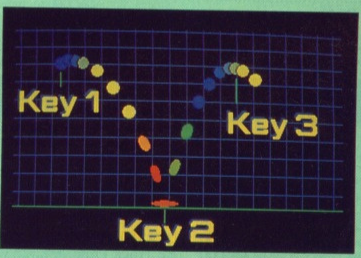
ANIMATING FOR THE VERY FIRST TIME



■ *All the frames of a bouncing ball animation overlayed to show you the work required. If you draw a ball on each screen in the positions shown and then flip between the screen quickly, you will get an animated bouncing ball. The key frames are marked clearly, so draw them first. The graphic shows all the positions of the ball travelling to the top of its arc and down again. The animation lacks what animators call 'snap'. The ball remains a rigid circle throughout its path.*

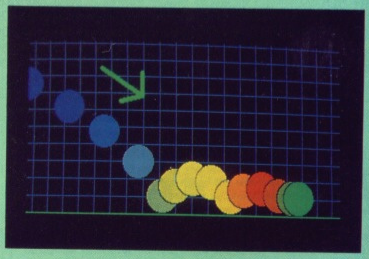
■ *'Squash and stretch' have been added to the ball. These are exaggerations on what gravity and inertia do to a real ball; the results are much more natural than the original animation. By adding squash and stretch the motion becomes more dynamic. You can add too much dynamism though. Each subject will be able to take greater or lesser amounts of squash and stretch. It's up to you to discover the threshold.*





■ *The ball is much lighter in this animation – a ping pong ball perhaps – and consequently the motion differs. Notice that the ball moves very fast on the bounce, but very slowly at the top of the arc. The distortions are also amplified. The opposite to a ping-pong ball might be a ball bearing – they don't bounce too well.*

■ *And here's the flight path of a ball bearing. Because of the nature of ball bearings, the ball does not loose its shape in flight and quickly comes to rest. An interesting addition to this animation might be to make the floor give under the weight of the ball. If you accomplish this to your satisfaction, try shortening the distance of the bounce so that you can get several bounces on screen. Make each subsequent bounce smaller so that the viewer gets the impression that the energy of the ball decays gradually.*



For this example you will require a piece of software that lets you draw a simple shape and store several screens in memory. Amiga owners can use *Fantavision, Aegis Animator* or similar. ST owners can use *Aegis Animator, Cyber Paint* or even a slideshow program with pictures held in a RAM disk.

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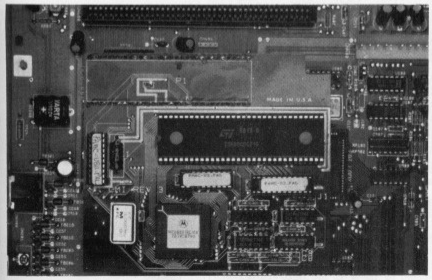
The Motorola M68000 family of microprocessors embody the most beautiful architecture to be found among today's popular processors. Code written for the 68000 will run on the 68010, 68020, 68030 and – say Motorola – any forthcoming members. This offers a simple and technically gratifying upgrade path for programmers during the coming years. To own an Atari ST or Commodore Amiga and not know how to program the wonderful 68000 processor contained inside is like driving a car with the handbrake on.

At first sight 68000 assembly language appears to be a formidable concoction of numbers and symbols. Ironically the apparent confusion in a program section dealing with screen handling, say, seems no different in form from a section for reading the mouse. In truth 68000 assembly language – sometimes called assembler, machine code or code – is very simple. It is simplicity that makes one section of code seem much like any other. Nonetheless, clear distinctions between different sections can easily be made by documentation, that is by placing comments at appropriate places.

In this and later articles you will discover that programming the 68000 is really quite straight forward. A reassuring point to bear in mind is that it is not necessary to know the entire 68000 assembly language in order to write acceptable programs. For example, MOVE.B 7(A3,D6.L),(A2)+ looks horrendous when compared to MOVE 6,D0. In fact, it is just more of the same.

The processor works by reading numbers from either ROM or RAM. These numbers (machine code) are interpreted by the 68000 as instructions. Numerical instructions are very awkward for human beings to understand; that's why a set of mnemonics, collectively called assembly language, are used instead. A program known as an assembler converts the assembly language mnemonics into machine code, saving the resulting list of numbers as a file on disk. When the machine code program is run, by double-clicking on its icon in a GEM window (ST) or typing its filename at the CLI prompt (Amiga), the numbers are placed in an unused part of the computer's memory. The 68000 is then instructed by the operating system – which is itself machine code (nepotism indeed) – to start reading the code and thereby execute the program.



Inside every ST and Amiga is a 68000 micro processor. This is the heart of the machine and is responsible for keeping an eye on the rest of the system. Assembly programming is all about communicating with this chip.

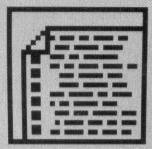
Dentist's drivel

Computers deal with single items of data called bits which can take a value of 0 or 1. However, it is often convenient to handle bits in groups of eight, 16 or 32. Bytes, words and longwords respectively. 1K is 1024 or 2^{10} bytes. 1Mbyte is 1024K or 2^{20} bytes. A single byte may be represented in binary as

```
  x  x  x  x x x x x
bit number
  7  6  5  4 3 2 1 0
decimal equivalent
128 64 32 16 8 4 2 1
```

A byte represents 2^8 (256) different numbers: 0 to 255.

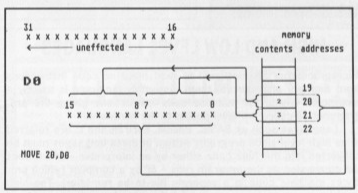
```
binary      decimal
00000000      0
00000001      1
00000010      2
00000011      3
00000100      4
etc
11111111      255
```



REAL NUTTERS

For each machine code instruction the 68000 reads, it executes a short program in 'microcode' using it's own on-chip ROM. Microcoders are the real heroes employed by semiconductor manufacturers. Some other microprocessors, such as the Zilog Z80, have 'hardwired' machine code instructions which execute directly.

MOVE TO THE BEAT



The instruction MOVE 20,D0 moves the number found in the word (two bytes) at memory location 20 into the register D0. A word is moved because the 68000 is a 16-bit microprocessor. In fact, the byte at location 20 is moved into bits 15 to 8 of the register D0 and the byte at 21 is moved into bits 7 to 0 of D0.

If memory location 20 holds two and location 21 holds three then, after the MOVE 20,D0 instruction, the upper word of D0 (bits 31 to 16) are unchanged but the lower word contains 515:

```
bit     15              8 7              0
        x x x x x x x x x x x x x x x x
binary  0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 1
```

If you want to get one byte you would use MOVE.B 20,D0. Similarly to fetch a longword you would use MOVE.L 20,D0. The first part of an instruction is called the operator (MOVE, say). By appending .B or .L to the operator you tell the machine to handle bytes or longwords. A .W can be used for words, but this is the default since the 68000 is a 16-bit device.

To the right of the operator may be found one, two or no operands. Whenever there are two operands, as in MOVE 20,D0, they are separated by a comma and there is always an operating direction from left to right. So for MOVE 20,D0 a word is moved from 20 to D0

LONG IN WORD

By now you should know bits from nybbles, bytes from words and longwords (or doublewords if you follow Intel's 80386 literature) from... err, very longwords. No! According to Motorola 64-bits make a quadword.

NAAAGH! MINE'S FASTER

Clock circuitry synchronises the data transfers between chips. In general higher clock rates are associated with faster computing. The ST has a 68000 clocked at 8MHz (eight million clock cycles per second) while the Amiga has a 68000 running at 7.16MHz. Hence, assembly language programs run 11.7% faster on the ST than on the Amiga. however, dedicated hardware in the Amiga provides faster graphics and sound processing.

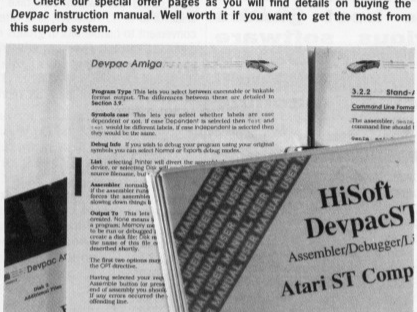
HISOFT DEVPAC ASSEMBLER ON COVER DISK

To write assembly programs you need an Assembler. Without doubt the best package along these lines is HiSoft's *Devpac*. And guess what? Yes! On this month's cover disk you'll find the original *Devpac*. It's a complete Assembler, debugger and linker. In short, it's all you need to create red-hot machine code.

All the information you need to use the system is included in the disk pages. You'll find a command summary on the disk itself. In the forthcoming months *Devpac* will be used extensively. Why not start using it now? You can't do any damage to you computer.

To use the *Devpac* Assembler double click on the GENST.PRG icon (ST) or type `run genam` at the Amiga's CLI prompt. You will be presented with an editor. Assembly language may be typed in here and assembled from this editor. You've loaded it so now go to the disk pages to see what to do next.

Check our special offer pages as you will find details on buying the *Devpac* instruction manual. Well worth it if you want to get the most from this superb system.



HIGH AND LOW LEVEL LANGUAGES

Microprocessors are designed to read machine code instructions from memory and execute them. Assembly language is merely a mnemonic device for machine code instructions giving the programmer so-called low level access to the hardware.

Languages such as BASIC, Pascal, Fortran and C are referred to as high level since programs written in these languages must be converted into machine code either by an interpreter – which does the conversion as the program runs – or by a compiler (which produces machine code in a separate file to be run later). The high level language environment can be thought of as sitting on top of the low level machine code environment.

Writing in high level languages is generally held to be easier and quicker than writing in assembly language. So why not stick to a high level language like C? Simply because a compiler never produces very fast code and always produces long code. In translating the various high-faluted control constructs and data types under the constraints imposed by the dogma of 'good structure', the compiler makes bad use of registers and much thrashing results. You need only disassemble the ST ROM (mainly compiled C) or the Amiga ROM (mainly compiled C and BCPL) to witness the utter jiberish produced by a compiler.

To be fair, high level languages do allow a high degree of portability from one type of machine to another, although hardware differences usually result in some rewriting.

In the extreme, Pascal should be reserved for Academia where people can worship the purity of perfect structure; Fortran can stay with crumbly old scientists who trot from building to building clutching punched cards for batch processing; C will be used by fast-buck merchants who rely on sales to the 'computer-literate but technical no-hopers' in the business world; whereas assembly language is for the idiots with more time than sense who never meet deadlines and are proud of it! It is easy to write bad assembly language programs, but all the best programs are written in it.

Two bytes together, or 16 bits, form a word. A word can range from 0 to 65535 (2^{16} different numbers). Four bytes or 32 bits form a longword giving 0 to 4294967295 (2^{32} numbers).

Just as bit 7 in binary represents 128 so bit 8 represents 256. Hence, word 0000000100000000 in binary is 256 in decimal.

Cut up

The processor spends most of its time moving data and operating on data. In order to aid data manipulations, the 68000 contains its own small chunk of memory called registers. There are eight data registers labeled D0 to D7 for holding data and eight address registers A0 to A7 for keeping track of where in main memory (RAM or ROM) it is possible to find large amounts of data.

All data and address registers are 32 bits long.

The 68000 remembers where it can find its next machine code instruction using a register called the Program Counter or PC. The PC is said to 'point' to the next instruction; Instruction Pointer might have been a better name for it! The PC is automatically incremented after each word of machine code is read, thereby pointing to the next instruction.

In order to record the outcome of arithmetic and logical operations, the 68000 provides a register known as the Condition Code Register (CCR) that uses the low order five bits of a byte as flags:

```
7               0
x x x x x x x x
      X N Z V C
```

Each flag is just a single bit that is either 0 (clear) or 1 (set).

C – Carry. This is set if an arithmetic operation needs, or generates, a carry.

V – Overflow. Set if an overflow occurs during an arithmetic operation.

Z – Zero. If the result of an operation is zero then this is set.

N – Sign. Is set if the result of an operation is negative.

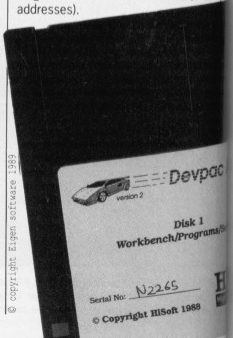
X – Extend. This is the same as the C flag, but operates with only a limited number of instructions.

The condition flags are not usually used directly by the programmer, but instead their use is implied in instructions. For instance, BEQ label means jump (or branch) to the place in the program where label is located if the Z flag is set (equals).

Memory organisation

Because there are a great many bytes of memory in computers, they have to be organized in an ordered fashion. Each byte is fixed at a definite location or address. Bytes may be found in the range 0 to 16777215 (2^{24}). This gives 16Mbytes. In practice there is much less memory available – 512K RAM for a 520ST and A500 Amiga – so many of the addresses are unoccupied.

Address registers are used to 'point' to addresses in memory. It is important to remember that although the 68000 can read (or write) a single byte from (to) anywhere in memory, it can only read or write words and longwords on even boundaries (even addresses).



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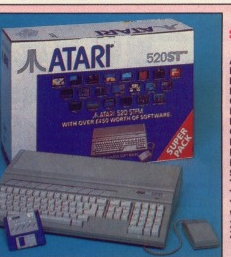
520ST-FM SUPER PACK

1Mb DISK DRIVE £450 OF SOFTWARE



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All prices correct at the time of going to press. E&OE

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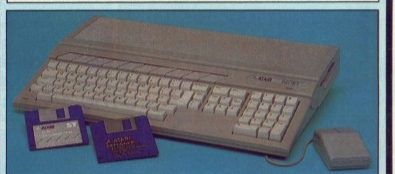

The value for money offered by the Atari ST range is reflected in the Explorer Pack featuring the 520ST-FM computer with 512K RAM. The 520ST-FM computer now comes with a built-in 1 Mb double sided disk drive as well as a free mouse controller and a built-in TV modulator. The new 520ST-FM Explorer Pack includes the 520ST-FM computer, the arcade game Ranarama, a tutorial program and some useful desktop accessories. In addition, if you buy the Explorer Pack from Silica, we will give you the Silica ST Starter Kit worth over £200, FREE OF CHARGE. Return the coupon for details of our Starter Kit and of the full ST range.

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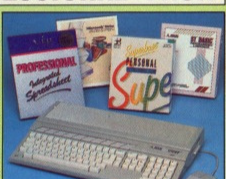

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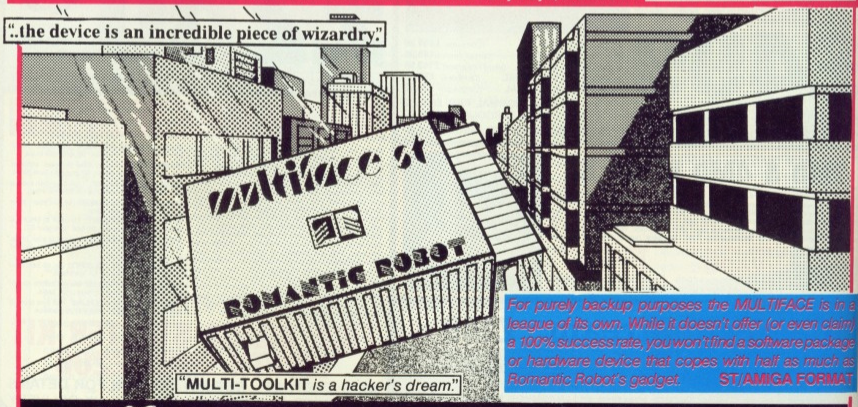

For purely backup purposes the MULTIFACE is in a league of its own. While it doesn't offer (or even claim) a 100% success rate, you won't find a software package or hardware device that copes with half as much as Romantic Robot's gadget. **ST/AMIGA FORMAT**

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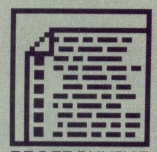
OPERATING BETTER



It's here at last – version 1.3 of the Amiga's Workbench operating system. BEN TAYLOR turns a few tricks with the new features on offer, and also sneaks a preview of what's in store for ST owners with the forthcoming new TOS ROMs.

AMIGA

ENHANCER SOFTWARE (AMIGADOS 1.3)

£14.99 (optional ROM £14.99 extra) ■ All Amigas ■ via Commodore dealers

The best things are worth waiting for, the saying goes. Candlelit dinners for two, fame, fortune, the Second Coming, the BBC finally axing *Bob's Full House*, and, of course, AmigaDOS 1.3. It was almost a year ago that Commodore officially announced a new version of the Amiga's operating system, and initial shipping date in the States was expected to be May 1988.

What's in a name?

The Enhancer pack contains three disks – KickStart 1.3, Workbench 1.3 and Extras 1.3. The Kickstart disk is for A1000 owners only – Amiga A500 and A2000s don't need it, so they've got a free reusable disk.

Starting up Workbench 1.3 is exactly the same as using the current version, 1.2 – you turn on the machine and put the disk in. You won't notice much difference on the main icon-based display screen, except that you've got about 23K less of free RAM. In theory, this could cause problems with some programs which are extremely tight on memory, but so far all recent software we've tested seems to run perfectly.

If you're lucky enough to have a hard disk, you'll find access times dramatically faster – up to eight times in some cases. Unfortunately floppy disk owners don't get any benefit from the filing system changes.

If you never use the Amiga's CLI (command line interface), you won't notice much difference. It's when you get to that tantalizing '1>' prompt that the whole deal changes.

First impressions

The first thing you notice is that the icon you click on to launch a new CLI is called 'Shell' rather than 'CLI', and the prompt is `1.Workbench1.3:>` instead of `1>`. Your current default directory and disk name are included as part of the prompt, to remind you where you are. If you use lots of sub-directories you may find your prompt gets to be longer than your command line!

The command line 'history' (a record of the last few commands) is available, so if you make a typing mistake you can just press the up-arrow key, edit the line, and press [Return] to try again. Beautiful.

Pack your printer

One of the major areas of improvement in 1.3 is the printer drivers. These little beasties control how fast and accurately your printer reproduces what's on the screen, and since each printer has its own idiosyncrasies you need to have a large number of drivers. There's now support for the HP PaintJet and InkJet printers, 24 pin Epson LQs and many more. Printing time for graphics screens is speeded up by three times in many cases.

The version 1.3 printer drivers have been widely 'leaked' with various commercial programs – anybody who's bought an art package in the last six months will probably already have them. If you've got 'PaintJet' and 'EpsonQ' in your Preferences list then you've already got them.

One problem is that there isn't room for the large number of new

KICKSTART ON ROM

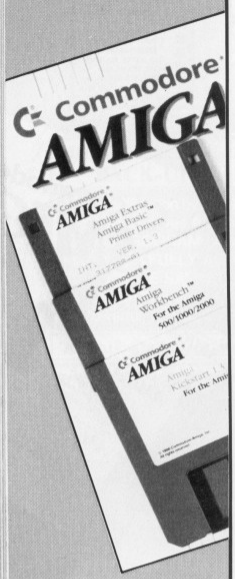
There are subtle changes to Kickstart in AmigDOS 1.3, hence the new disk for A1000 owners. A500 and A2000 owners can buy new Kickstart ROMs for their machine, but you don't really need it. Without Kickstart 1.3, you can't boot from hard disk, but that's no great loss to most people. The ROM – which dealers will fit for you – costs £14.99.

ROLLING BACK THE YEARS

If you're a new owner who bought your Amiga maybe at Christmas, you're being spoiled rotten by Workbench 1.3. You'd be surprised at just how much Amiga owners of yore had to put up with.

The first Amiga was the A1000, launched in late '85. The A1000 didn't have any ROMs, so before you could start Workbench you had to 'pre-boot' with a disk called Kickstart. The A500 and A2000 have Kickstart in ROM, so nowadays you just put your Workbench disk in directly.

The version 1.0 Amiga operating system is remembered with mirth. If the machine ran for five minutes without crashing it was a major achievement. Version 1.1 soon followed, which was a little more robust, but still lacked a few features compared to version 1.2, which came on the scene in late '86. For instance, very few CLI commands allowed you to use wildcards, and the disk directory was fragmented over the whole disk. If you think that the Amiga drives are slow now, you should have seen them two years ago!



printer drivers on the Workbench 1.3 boot disk. They are all on the 'Extras' disk and you need to run a special installation program to transfer the one you want to your boot disk.

So, apart from command line history and new printer drivers, what's in Workbench 1.3? Although there isn't room for a comprehensive list of new features, here are the main ones with a few hints on what they're for:

RECOVERABLE RAM DISK – a RAM disk, as you know, is an area of memory which acts like a superfast disk drive. The standard RAM disk on Workbench 1.2 has two drawbacks: it eats up memory, and when the machine is reset the contents are lost. The only solution to the first problem is to buy more memory; the second one has now been addressed.

Type `MOUNT RAD:` at the CLI and the recoverable RAM disk is installed. Its disk icon won't appear until you use it, eg. `DIR RAD:`. Unlike the standard RAM disk, it doesn't expand and contract as required – it's a fixed size. By default that's 242K, but you can reduce this by editing the 'mount list' file as required. Incidentally, with all the other system overheads the 242K default size leaves you with only 36K free on a standard A500!

All files on the RAD: device are now preserved when you do a Control-Amiga-Amiga reset, or if there's a Guru software crash. If you have Kickstart 1.3 ROMs you can arrange to boot Workbench from it.

ALIAS – save yourself some typing by abbreviating those long AmigaDOS commands. You can use ALIAS in any Shell (CLI); aliases defined in one Shell window don't apply to other ones. For example, if you regularly type the command `LIST PAT #?.DOC`, you can issue `ALIAS LD "LIST PAT #?.DOC"` which means that typing `LD` afterwards lists out all DOC files.

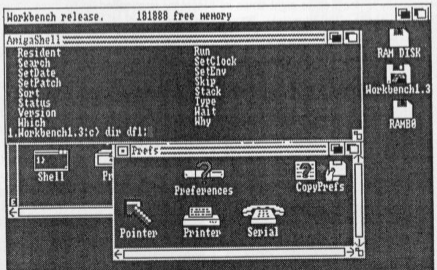
CLOCKPTR – a cute novelty which you may or may not find useful allows you to turn the cursor into a tiny digital clock just by clicking on the ClockPtr icon. The time display only shows when you click on an area of a Workbench screen backdrop, otherwise it is a conventional arrow.

EVAL – lost your calculator? Enter the new CLI command EVAL. This can do simple arithmetic and bit operations ('and', 'xor', shift left). `EVAL 2 * 2` gives, um..., 4. Curiously, you need spaces between all the items in an expression. You can specify numbers in decimal, hex, octal or as ASCII codes. Apart from the obvious applications, EVAL can be used in scripts as a counter for loops.

ENVIRONMENT VARIABLES – dommunication between different tasks on an Amiga has always been a bit sticky, and environment variables are a new way around this. One script file can create a global system variable for another application to read. You can pass directory names, success/failure flags and so on around. The command `SETENV SUCCESS "OK"` in fact creates a file in the RAM disk called SUCCESS with the text 'OK' in it.

ICONIX – an invaluable utility available in the public domain for some time that has finally gained the official seal of approval. ICONX lets you attach an icon to a CLI script file. This means that you can make previously CLI-only programs available to users who are frightened of the good old 1> prompt: clicking an icon at the Workbench will open a dummy window and run the commands in your script file.

To run a script file called FERGIE, you would create an icon called FERGIE.INFO (it must be of the 'Project' type, like a Notepad file). Then you use the Workbench 'Info' option in the 'Workbench' menu to set the icon's default tool to C:ICONX. Double-click, and hey presto.



■ ***Workbench 1.3 in full flow. Note the recoverable RAM disk icon RAMBO: (!) at the top right, new Preferences icons and the altered CLI prompt showing your current logged disk and directory.***

BEYOND AMIGADOS 1.3

Commodore make no pretence that AmigaDOS 1.3 is the last word in the Amiga's system software's development. Indeed they are openly working on Workbench 1.4 as you read this (don't expect results this year though!).

In Format's humble opinion, there are four obvious flaws with AmigaDOS which need to be attended to in future:

■ Floppy disk access times must be speeded up (AmigaDOS 1.4 will improve this).

■ Resident ROM commands for simple functions are needed: no sensible operating system needs to load a program from disk before you can get a directory of that disk. Put DIR in ROM, Commodore!

■ Default icons: There should be an option to let you see *all* files on the Workbench screen, not just the ones with predefined icons.

■ Task isolation: To make multitasking useful, when one task crashes the Amiga should be able to kill that task and recover. At the moment, every other active task crashes too.

RESIDENT – If you only have one disk drive you can find yourself involved in a lot of disk swapping as AmigaDOS demands to see your boot disk to load even a simple command like DIR. The new command RESIDENT provides a way around this: `RESIDENT DIR`, for instance, loads the DIR permanently into memory (of course, your free RAM decreases as a result!)

Not all commands can be made resident. Programs have to be 'pure', meaning well written so more than one task can use them at the same time. Most of the C directory system commands are pure, and you can actually force 'impure' files to be made resident anyway by the command `RESIDENT <filename> PURE`.

SKIP BACK – a small but significant change in the SKIP command will revolutionise life for Amiga script file programmers – at last you can SKIP to a label higher up in the file than your current position. `SKIP LOOP1 BACK` will jump to label LOOP1, searching from the top of the file.

Conclusion

Workbench 1.3 is a must for any sentient Amiga owner. If you don't do anything more than stick games disks in your machine then you probably won't need it, but for everybody else it's the best £15 you'll spend.

TOS 1.4 PREVIEW

Anything you can do I can do better... Not to be outdone by Commodore releasing a new version of Workbench, Atari are soon to let loose an updated set of ROMs for the ST. What's in store?

ST

There's one big difference between the ST and the Amiga: the ST runs all programs by WIMP operation, whereas the Amiga has a command line interface (CLI) too. To be honest, there's not much you can do to redesign the ST's system in which the only way to run a program is to position the mouse over and icon and double-click on it. Consequently, ST users shouldn't expect TOS v1.4 to be quite as revolutionary as Workbench 1.3 on the Amiga

■ New File Selector

In any GEM application, when you need to open a file you are faced with a standard 'dialog box' where you can select the file to be opened by clicking on a disk directory listing. On the current TOS, to get the directory of a different disk drive you have to edit the path name to insert the new disk drive letter – on TOS 1.4 you can just click on the letter.

■ Rename folders

The 'Show Info' menu item lets you rename folders as well as files.

■ Less disk swaps for copying

A more sophisticated Copy process makes better use of memory. On a single drive machine, if you copied a file from one disk to another by dragging it to drive B and following the swap prompts, one file could take 4 swaps, two files 8 swaps, and so on. In 1.4, copying several files in bulk will write them all to memory first (if there's enough) and then write them out to the new disk. Only one or two swaps should be needed at most.

■ File move

If you hold [Control] down while dragging files, they are *moved* rather than copied (the original version will be deleted).

TOS AND GEM?

ST users are often confused by the terms 'GEM' and 'TOS'.

GEM ('Graphics Environment Manager') is the system of icons and windows that appears on your screen when you turn on your ST. It is a standard operating system designed by Digital Research for several computers, and therefore it doesn't change very much.

TOS ('The Operating System', not 'Tramiel Operating System' as some pundits would have you believe) is the lower level system which converts the general GEM functions into ST-specific machine code.

In theory, you never see TOS working directly, so a new version of TOS might speed the ST up but it shouldn't alter the look of GEM at all. In the case of TOS 1.4, many of the GEM alert boxes *have* been changed – presumably for legal reasons Atari can't describe it as a new version of GEM.

■ Hard disk speed increased

If you have a fairly full hard disk, better control of the disk 'file allocation table' (the FAT) means you'll get dramatic speed increases. There's not much benefit for floppy disk users though.

■ MS-DOS compatibility

Apart from a rather gimmicky ability to reboot the ST by the PC-standard [Control][Alternate][Delete] key chord, the disk format has been altered to be the same as the IBM PC 3.5" disks. All old ST disks will still be read normally.

■ Stop it!

In a good bit of user-friendliness, you can now interrupt long batches of file copying or printing. Pressing [Undo] aborts any printing, copying, deleting or moving operations.

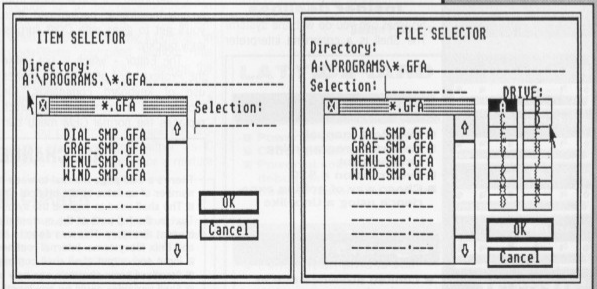
Should you go for it?

TOS v1.4 looks as though Atari have put a lot of hard work into it, and it definitely makes the ST more pleasant to use. The ST's TOS is built into ROM, so unlike Amiga owners who buy Workbench 1.3, ST upgradees will have to do some serious hardware hacking.

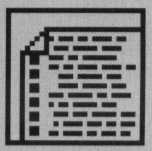
For the majority of users the changes are cosmetic, and don't warrant the risk of damaging your ST. You can get the equivalent of the new file requester by using the PD program *FSEL*, (which was on *Format* SuperDisk #7) The most useful change is for single disk drive users, for whom the improved Copy function will drastically cut disk swapping.

INSIDE STORY

Although journalists are exalted beings, even we haven't managed to get hold of the version 1.4 ROMs two months early. This preview is based on a pre-release version of TOS 1.4 distributed on a disk for developers. No price for the final upgrade ROM kit has been announced, but we'd expect £15-£20.



■ *File requesters old and new – changing disk drives is much easier in the new version. With the old style file requester you must change the drive identifier by hand. With TOS 1.4 it's simply a matter of clicking on the desired drive icon. It's a pity Atari haven't gone further and provided all the features found in HiSoft's file selector or even FSEL given away on the issue 7 cover disk. Still, the 1.4 version is an improvement.*



PROGRAMMING

TECH TOOLS

The ST and Amiga are powerful machines, and it takes a powerful lot of programming to get the most out of them. So you'll need the right tools for the job. Check out Craft 2, giving the ST programmer a Unix-like interface, and also a stunning new version of Lattice C on the Amiga.

CRAFTY CODE

Unless you were born with a silver Unix workstation in your mouth then it's likely that many of the terms in this review will leave you floundering. Flounder no more:

***Piping* is a mechanism that permits you to use the output of one command as the input of the next.**

***Aliasing* is a convenient way of abbreviating often used commands and command sequences.**

A *Stream Editor* is an editor that processes a file taking its instructions from another file.

***Globbing* doesn't exist, but it presumably means global searching.**

ST

CRAFT 2

£99.95 ■ All STs ■ Commedia/HiSoft, The Old School, Greenfield, Bedford MK45 5DE (0525 713716)

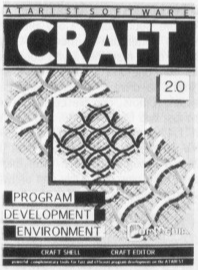
Alternative work environments for the ST abound; there's Minix (reviewed last month), Mirage, OS9 and many others. Craft 2 is the latest addition – imagine a Unix C-shell running in 40 columns on a colour monitor! It gives you two powerful tools for fast program development: Craft Shell and Craft Editor.

The Shell replaces Desktop with a command line interface (CLI) similar to the Unix C shell. Features include 80 internal functions and keywords, programmable full script language, input/output redirection, aliasing, batch processing, in-built disk cache and printer spooler, Unix or GEMdos pathname compatability,ability to run GEM and 25 external utilities.

Insider dealings

So what can you do with the system? The Shell is a command interpreter that lets you execute instructions that are longer and more complex than those available from the GEM Desktop. You can access the ST's filing systems more easily (once you've learnt the idiosyncratic command line instruction set, that is), redirect the input and output of programs and perform all manner of operations that simply aren't possible using a WIMP system.

The Shell combines features



found in the Unix C-shell, AT&T Unix Bourne shell, Unix Korne shell and the DCL interpreter – if you've come from a mini/mainframe background then you'll get to grips with *Craft* surprisingly quickly.

The Editor – which is not unlike the *Protext* word processor – makes use of keyboard commands, the mouse and a command line which replaces the normal GEM menu bar. The keyboard commands take care of most of the basic editing functions such as insertion and deletion, cursor movements, and various other text manipulations. The command line is for executing more powerful commands or sequences of instructions.

Many options exist for personalising the Editor work environment; these are stored in a file which is automatically loaded when the Editor is booted.

Up to 10 buffers are available for editing purposes and 10 'learn buffers' which can remember up to 100 keystrokes each. There's also a 'fold' feature which works in a similar way to procedure packing found in GFA BASIC V3's editor; sections of the document can be hidden with just the procedure names showing. You have much more control in *Craft*'s editor, however, as it is possible to determine which bits to fold.

Worth its weight?

It's worth getting *Craft* for the Editor alone. The same can be said for the Shell. Having the two together makes for a very powerful work environment.

It's not necessary to have used Unix before as the *Craft* manual is so good. Although there is the occasional odd turn of phrase and made-up word, the manual does justice to the product. It's informative, contains clear instructions and is properly indexed. Overall, then, a superb package that will appeal (sadly) only to a select few.

Richard Monteiro

features 0 1 2 3 4 5

performance 0 1 2 3 4 5

ease of use 0 1 2 3 4 5

manuals 0 1 2 3 4 5

format value 0 1 2 3 4 5

CRAFT 2

for

- Excellent manual
- Powerful programming environment
- Even runs on a 520
- Cheap way of getting experience using a Unix-like

against

- Limited audience due to price and nature of the product

ALL CHANGE IN VERSION 2

There's a 660 page manual to wade through which details an unbelievable number of updates to the original *Craft*. Here's a brief look at what's new:

- **The shell used to expand the symbols . and .. to the paths they referred to. That is, the full path of the current directory and the path of the parent of the current directory. This was done to hide incompatibility between the GEMdos and Unix filesystems. Internal routines now make the differernces invisible.**
- **Input and output of all shell commands may be redirected.**
- **Standard error channels can now be routed through a pipe.**
- **Shell variables could be any length in older versions; this is now cut back to 20 characters. The first character must be a letter; no such restriction is placed on the rest of the characters.**
- **Better wildcard facilities. For instance, *prg will find shell.prg. This wasn't true in earlier versions.**

LATTICE C v5

£241.50 ■ All Amigas, 1 MB recommended ■ Metacomco, 26 Portland Square, Bristol BS2 8RZ (0272 428781)

For the traditional Amiga programmer, writing in C always meant using Lattice C. More recently, with the likes of Manx Aztec C riding high in the popularity stakes, the choice of which system to buy is not so clear cut. This latest release promises a more integrated system much like C Compilers found on the PC – can Lattice fend the increasing competition off?

Diskount rates

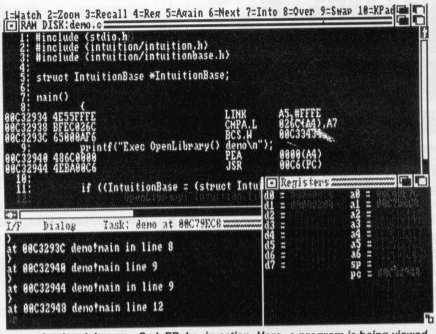
Every time Lattice release an update, the disk count increases; version 3.10 came on two disks, version 4.01 jumped to four and this latest release comes on a hefty five. The first thing that will strike you about version 5 is the sheer professionalism of the whole product. Gone is the old spiral bound manual and in are two whacking great ring binders that contain between them, over 800 pages of solid information.

The most important part of the system is naturally the C compiler itself. The version 5 compiler is a much faster beast that produces leaner and more efficient code. Lattice claim speed increases of up to 10% over version 4.01.

One of the most major additions to version 5 is the inclusion of the *Lattice Screen Editor* (LSE), a fast and powerful text editor. Probably the best feature of LSE is the ability to compile your program from while editing. Then, if a compilation error is detected the editor jumps straight to the offending line. LSE will seem to many a real god-send as it can considerably decrease the amount of time taken to develop your software.

Probing the Guru

Version 5 also sees the release of what looks set to become one of the most used of all Amiga programming



Lattice debugger, CodePRobe, in action. Here, a program is being viewed in mixed mode; as C and the assembler equivalent.

tools; the Lattice *CodePRobe*. CodePRobe is a source level debugger which betrays a remarkable similarity to the Manx SDB debugger released last year. If your program starts to do peculiar things when you run it, or crashes the machine all together, you can load it into CodePRobe and observe the program as it slowly wreaks havoc.

To use CodePRobe, you must include full debugging information in your program by using the `-d3` option when compiling. Loading a program in CodePRobe compiled without this option will restrict you to viewing the assembler version of your program, much as what you would get from a disassembler.

You can choose to view the program being debugged either as C source code, assembler or a mixture of the two. Being able to view a C statement with the assembler equivelent could be very useful when trying to optimize your code; it could also be a great asset when learning assembler. From within CodePRobe, you can single step through your program and view at a glance the value of all identifiers and structures as well as your program's effect on the 68000's internal registers.

BLinking Useful

Other new tools include a brand new version of BLink, the standard Amiga linker, and a very useful global code optimizer that is used to clean up your code by analyzing program control structures and watching out for 'dead' variables that are used once and perhaps never referred to again.

Lattice have managed to produce the first truly professional development system available to the general public. With version 5, Lattice seem set to do to the C compiler market what HiSoft have done to the assembler market with *Devpac 2*. Currently, there is just nothing to touch this latest release.

Jason Holborn

BENCHMARK CORNER

Enough of all these fancy features. How well does version 5 perform compared to its predecessor, Lattice C version 4.01? We ran a couple of tests and came up with the following results:

	VERSION 5		VERSION 4.01	
	File size	Speed	File size	Speed
Simple 'Hello World'	6.3K	–	7.4K	–
100000 Floating point operations	15.4K	25 secs	12.3K	27 secs
10000 Square root calcs	17.4K	22 secs	14.0K	22 secs

LATTICE C v5

for

- Powerful screen editor
- Code optimizer included
- Powerful source level debugger
- Code is faster and leaner

against

- Compilation time is still relatively slow
- Hefty price rise from v4.01

features 0 1 2 3 4 5

performance 0 1 2 3 4 5

ease of use 0 1 2 3 4 5

manuals 0 1 2 3 4 5

format value 0 1 2 3 4 5

HISTORY LESSON

In the early days of the Amiga, way back in late 1985, software development tools were hard to obtain. The *official* development systems issued to software developers consisted of *Amiga C*, an assembler and various other tools. This official C compiler wasn't as many thought, a Commodore product, but was in fact written by the American software company, Lattice Inc. Lattice C became the Amiga C development system just because there was nothing else out there – it was as simple as that!

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KRYSTAL	54.94	24.98	49.98	23.98	55.98	24.98	49.98	24.98
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DESKTOP

When your favourite word processor starts snarling at you, or your mouse takes to biting your fingers, then it's time you came down to Desktop for all the latest tricks and tips. This months winner is Rod Lavers from East Sussex for his autobooting information. £30 will be on its way to him just as soon as our master forger gets back from his hols.

Disc boredom

Loading files from a well-used disk can become a hazardous experience. Often, when you have saved and erased one program after another, the amount of time taken to find and load a file can be dramatically increased. Another side effect of poorly 'scattered' files is occasional loss of data. By removing all your files, erasing everything on the disk and then re-saving the whole lot you can reduce the loading time by up to 40%. This causes massive access savings if the same principle is applied to a hard disk.

Jane Wilcox
Whitby, North Yorkshire.

Standing over STOS

The tip in February's issue of *Format* informed *STOS* owners how to make run-only copies of their adventure games. A far better method of achieving this important task is to first boot up with your *STOS* Basic disk and then load STOSCOPY.ACB from your accessory disk. List the program and then edit the last three lines as follows:

```
120 Data 78776, 2141,
15976, 16149, 12657,
2560, 2304, 2064, 3852,
2241, 1648
130 Data
"BASIC.BIN","RUN.BIN","FL
OAT.BIN","SPRITES.BIN","W
INDOWS.BIN"
140 Data "MOUSE.SPR",
"8X8.CR0", "8X8.CR1",
"8X16.CR2", "MUSIC.BIN",
"COMPACT.EXA"
```

Now, low and behold, you're able to save STOSCOPY.ACB and you'll have a running version of STOSCOPY which can be used to make your run-time programs as described in the *STOS* users guide.

If you only use the *STOS* sprite definer on a 520 ST and you try to explore the range of the animation features, you'll realise that you repeatedly get the 'Out of Memory' message. If you follow the above steps, but load SPRITE.ACB and list line 7015, you'll get:

```
7015 Reserve as work 8,
max(16384,min(free,32768)
```

Alter the last part to read `(free,10000)` and save SPRITE.ACB. Now you'll find that when loaded as an accessory, the animation works perfectly with a full memory bank of sprites.

John Hick,
Chard, Somerset.

AUTOBOOTING SOFTWARE

An autoboot program is one which will automatically run as soon as you insert a disk. Most games operate in this manner because it's one of surest ways of defeating software pirates. When you insert any disk into your drive and re-boot your computer, your humble ST immediately goes straight to the AUTO folder (if one exists) and then executes each program found there in the order that they were placed on the disk. The best way of automatically executing your programs, it seems, is to move them into this folder. Unfortunately this doesn't always work.

Initialise routines

When you switch on your ST and insert a disk, a short initialisation routine takes place. Your machine looks to see if an AUTO folder can be found. If found, the machine will move into this folder, load and execute any programs that it finds there and then call up GEM (the Graphics Environment Manager). This is where the complication with autobooting appears. Any program which makes use of GEM commands cannot be loaded.

So what do you use?

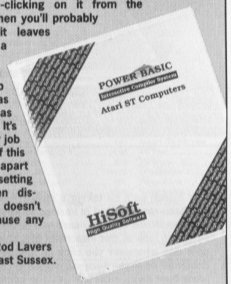
There are three basic types of program file on the ST; these have extensions PRG, TOS and TTP. Of these, PRG programs are the only ones to make use of GEM. Hisofts, *Power Basic* compiles programs which contain GEM graphics commands as PRG files. Any Non-GEM programs are compiled as TOS files. And if a program contains the function COMMAND$ then it will end up as a TTP (TOS takes parameters) file.

What you need to do is rename any program with a TOS extension and give it a PRG extension. Put this into an AUTO folder and boot up. And low-and-behold, you'll find that it loads successfully.

Afterwards

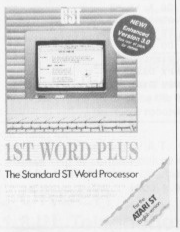
There is one small point to bear in mind: if you try executing a renamed TOS program at a later date (by double-clicking on it from the Desktop), then you'll probably find that it leaves behind a secondary cursor on the Desktop screen as soon as it has finished. It's not an easy job to get rid of this bug, but apart from upsetting your screen display it doesn't seem to cause any harm at all.

Rod Lavers
Hasting, East Sussex.



Curiouser and cursor

First Word can be a daunting program to virgin computer users. For those who have looked at the cursor and wondered how on earth to get rid of it so that it doesn't appear on the paper then here's the solution. Often frustrated people have tried to catch it with the mouse and delete it which might be brilliant exercise for prospective games players, but it doesn't do much good when you're desperate to print a document. Forget about it! You'll find that when a document is printed it won't appear with the rest of the text.



Alan Tugwell
Yate, Bristol.

Pieces of Protext

If you use Arnor's *Protext* and would like to be able to auto-boot it then all you need to do is copy the main PROTEXT.PRG program into an AUTO folder. Yes! It's that easy. The resource files and auto-exec routines should stay in the root directory. The only problem which can occur is with the latest version of *Protext* which gives you access to desktop accessories by

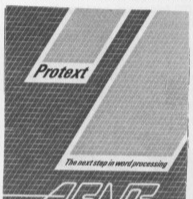
```
Many thanks as always to David Foster, without whom .... Press ESC key.
Ch 2006  Line 45   Col 7              No markers set                    Insert
130 Data "BASIC.BIN","RUN.BIN","FLOAT.BIN","SPRITES.BIN","WINDOWS.BIN"
140 Data "MOUSE.SPR","0X8.CRO","0X8.CR1","0X16.CR2","MUSIC.BIN",
"COMPACT.EXE"
Now save STOSCOPY.ACB and you'll have a running version of STOSCOPY
which can be used to make your run-time programs as described in the
STOSU users guide.
   If you only use the STOSU sprite definer on a 520 ST and you
try to make use of the animation facility, you'll repeatedly get the
'Out of Memory' message. If you follow the above steps, but load
SPRITE.ACB and list line 7015, you'll get:
7015 Reserve as work 8, hazil(384,minifree,32768))
   Alter the last part to read @(free,10000)@ and save SPRITE.ACB.
You'll find that when loaded as an accessory, the animation works
perfectly with a full memory bank of sprites.
John Hick,
Chard, Somerset

Printing problems
Buying printer ribbons is an extremely expensive habit; especially as
they have a nasty tendency not to survive much longer than a few
months. One trick, to preserve the life of your ribbons, is to remove
the lid of the cartridge and squirt in a liberal quantity of WD40,
```

pressing the right-mouse button. If you perform this operation after *Protext* has been auto-booted then you'll find that it crashes. This is because Desktop accessories are an integral part of GEM so unfortunately there's no way to solve this problem.

Another totally useless hidden feature in *Protext* can be uncovered by pressing [Shift] [Alternate] and [Help].

Andrew Gane
Fallowfield, Manchester.



Printing problems

Buying printer ribbons is an extremely expensive habit; especially since they have the lifespan of an armadillo under a steam roller.You're lucky if most cartridges survive much longer than a few months.

One neat little trick to preserve the life of your ribbons, is to remove the lid of the cartridge and squirt a liberal quantity of WD40 around the ribbon area. Printer ribbons often contain considerable amounts of ink even when they appear worn. Performing this simple operation ensures that you get the most out of your cartridges.

Philip Byford
Hemel Hempstead, Herts.

MONEY FOR NOTHING!

Yes, you have the chance of getting your mitts on loadsaloot! And at what cost to you? A few lousy lines of hints on getting the best out of a software package, or a hardware modification, or how to use the Desktop more efficiently or anything you feel will interest other avid ST users.

The star tipster each month will gain instant fame and great wealth (well £30 actually). So come on, share your secrets with 40,000 other readers. And perhaps it'll be your lucky day. Rush your GEMs to Desktop, ST/Amiga Format, 4 Queen Street, Bath, BA1 1EJ.

Unhealthy hopes

If you run the following lines of code in *Fast BASIC* you will be presented with a picture of a thoughtful sort of chap smoking a pipe.

```
GTXTSIZE 26
GTXTALIGN 3,2
GTXT 40, 40, CHR$ (28)
GTXTALIGN 3,0
GTXT 40, 40, CHR$ (29)
GTXTALIGN 5,2
GTXT 40, 40, CHR$ (30)
GTXTALIGN 5,0
GTXT 40, 40, CHR$ (31)
```

The picture is made up of four of the characters in the ST's default font (characters 28 to 31) which don't appear to be anything at all until you put them together like this. You can't PRINT them; they must be displayed as graphics. OK, it's not quite up to the standards of the digitised photographs hidden in the Apple Mac, but someone somewhere might find a use for them.

Ian Miles
Saffron Walden, Essex.

EXAMINING THE DESKTOP

This month we'll be taking a closer look at the DESKTOP.INF file which has been manipulated in various ways over the past few issues. Now, at last, we intend to make sure you're baffled no more by giving you the definitive look at this important file. This is the short file which is saved onto disk whenever you click on the menu option to SAVE DESKTOP. It's designed so that when you switch on your ST with a disk in the drive (your boot disk), a certain desktop configuration will be set.

You can edit this file using any simple text editor such as the one included in *First Word*. It's important that you switch off the wordprocessing option so that *First Word* will not treat your data as if it were part of a document – all the line and space codes will ruin corrupt your DESKTOP.INF file.

The Desktop file

Line	Data
1	#a000000
2	#b001000
3	#c77700070040600700552005055222077055707505550770311103
4	#d
5	#E C0 02
6	#W 00 00 0E 01 15 17 08 A:*.*@
7	#W 00 00 0E 01 15 17 00 @
8	#W 00 00 0E 09 15 0B 00 @
9	#W 00 00 0F 0A 15 0B 00 @
10	#M 00 02 00 FF D RAM Disk@ `@
11	#M 00 00 00 FF A FLOPPY DISK@ @
12	#M 00 01 00 FF B FLOPPY DISK@ @
13	#T 00 03 02 FF TRASH@ @
14	#F FF 04 @ *.*@
15	#D FF 01 @ *.*@
16	#G 03 FF *.APP@ @
17	#G 03 FF *.PRG@ @
18	#F 03 04 *.TOS@ @
19	#P 03 04 *.TTP@ @
20	#G 03 04 PROTEXT.PRG@ *.DOC@

The different lines which make up the DESKTOP.INF file relate to specific attributes.

Line 1: the various settings for your RS232 port.

Line 2: settings for the printer. Both line 1 and line 2 are set using the CONTROL.ACC accessory located on your Language disk.

Line 3: colors codes and the key delay/repeat settings.

Line 4: unused.

Line 5: saves the show directory command.

Lines 6 to 9: determine how and where the the different windows will open. For example, line 6 will display a window containing details of the programs held on drive A. If you change the *.* included in this line to something like *.PRG then only files with this extension will appear in the window. This can be especially useful for hard disks which often contain a vast number of data files that you don't really want cluttering up your display.

Line 10-12: drive icons. This line holds the locations of the drives, their names and the icon which will appear on screen. For example, you can alter certain parameters so that instead of a standard floppy disk icon you get a folder icon in its place. You can change the names of your floppy disk icons here.

Line 13: the coordinates, icon value and name of the trash can. If you wish to rename the trash icon to something less American then you're allowed to enter up to 12 characters.

Line 14 to 15: commands for the files and folders which possess an icon.

Line 16 to 19: the type of files which may be executed as a program file. That is, PRG and TOS extensions. With GDOS loaded you can have access to APP (application) files which make use of certain GDOS commands.

Line 20: the name of any installed application. The Desktop can be arranged so that by double-clicking on a file with a DOC extension it automatically loads an application with the file imported into it. Currently, you cannot search a second drive for this master file if the installed application resides on another disk. By altering this line you can configure your DESKTOP.INF file so that it will search drive B, a folder or even your hard disk.

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WORKBENCH

Where can you find more tips than the Himalayas? Workbench of course! Within the next two pages you'll find a mass of handy hints to help you get the best from your Amiga. This months lucky £30 winner is BARRY WHITEHOUSE.

Kickstart 1.3 tricks

If you're lucky enough to have Kickstart 1.3 installed in your machine or you A1000 owners have the official Kickstart 1.3 disk, then this tip will be of great interest to you.

■ *Installing the Amiga recoverable ram disk from the CLI*

Does the loading speed of Workbench annoy you? It often seem to take an absolute age for Workbench to load. Wouldn't it therefore be nice for the Workbench to instantly load when the machine is rebooted. Well, if you're lucky enough to have a 1Mbyte expansion, it is possible.

Hidden away on the new Workbench disk, you'll find a listing in the mountlist for a new RAD: device. This new device is in fact a powerful recoverable RAM disk that retains its contents even after reboot. If you have 1.3 Kickstart, you need only mount it once as the system will automatically call it each time you reboot. If on the other hand you're still using 1.2, then you'll have to mount it again everytime you reboot. A further advantage of using RAD under Kickstart 1.3 is that you can even have the machine boot from RAM disk – truely impressive!

To access RAD, you'll first have to drop down into the CLI. Before you can start using RAD, it must first be mounted onto the system device lists using the MOUNT command. This is achieved by typing MOUNT RAD:. RAD will install if you've got enough memory. If you haven't got Kickstart 1.3, you may have to format the RAD disk before it can be used. This is achieved using the FORMAT program in your system drawer.

It just remains for you to use the CLI to copy the LIBS directory and the various commands required from the C directory into RAD, and to create a startup-sequence for your new boot device. Reboot your machine without a disk in the internal drive and after a few seconds control will be transfered to RAD.

Darren Griffiths
Trowbridge

A real time saver

One very handy feature offered by the Amiga A2000 – and many of the RAM expansion cards available – is the inclusion of a battery backed clock. Unless you've got plenty of dosh, such a feature is a mere luxury and you are left with a system clock that dies every time the machine is switched off. Wouldn't it therefore be nice if the machine automatically asked you the time when you first boot Workbench? Yes, you've guessed it, you can.

Many AmigaDOS commands use 'templates' that show you the

USING A CPC MONITOR WITH THE AMIGA

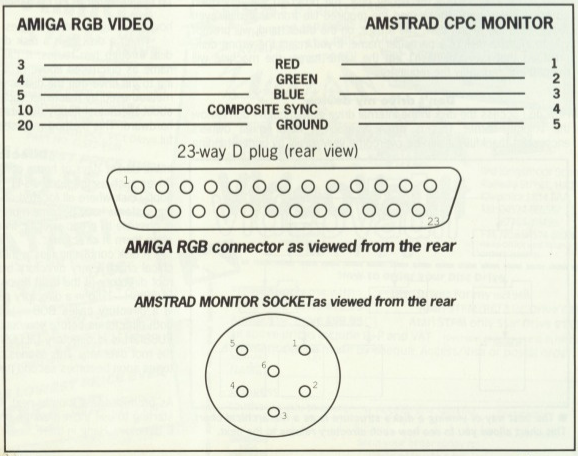
Handy stuff the old Amstrad hardware. Last month there was a tip on using the Amstrad DMP2000 printer with the Amiga and this month, if you upgraded from an Amstrad CPC computer, you can find out just how to link your old Amstrad colour monitor to the Amiga.

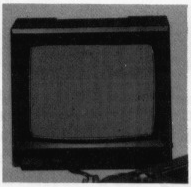
The Amiga has a vast colour palette and therefore not all colour monitors are up to the job. Any monitor that accepts a linear video signal, such as the Amstrad monitor, should be able to cope.

To make your Amstrad-to-Amiga lead, you'll need to get your hands on a number of components. Firstly you'll need a 23-pin female D-type connector for the Amiga, a 6-pin DIN socket for the monitor and about a metre of 5-way shielded cable. You may have problems getting your hands on the 23-pin connector as this is a Commodore specific component. You can get by with a sawn-off 25-pin connector; just cut off pins 13 and 25. The 25-pin variety are avialable from Tandy and other good electrical component stockists.

The wiring is fairly simple and only requires five solder joints. Once the lead is complete, just plug in and go. Some older Amstrad monitors may require some internal tweaking by an experienced electrical engineer.

BARRY Whitehouse
Milton Keynes





FAME AND EVEN LOOT TO BOOT!

Do you fancy yourself as a bit of an Amiga programming guru? or even an expert with the icons? Are you the master of your database or a Picasso with a paint package? If so, why haven't you already shared your wealth of wisdom with other Amiga owners; you could pocket £30 for your troubles!

We want tips on anything and everything. Whether you've got a tip on writing advanced user copper lists or just getting the most from Amiga BASIC, we want to hear from you. You don't even have to be a whizz with the C compiler: we want tips on anything to do with using and getting the most from the Amiga.

Send your noodles of knowledge to: **Workbench, ST/Amiga Format, 4 Queen Street, Bath BA1 1EJ.** *If your tip is best of the month, then you could earn yourself a nice big wodge of fivers (well, a cheque actually).*

format for using the command. These templates are usually called up when you enter a question mark (?) as the only parameter. This can be used to your advantage for getting a response from the user while a disk is booting. For example, if you enter `DIR ?`, a template will pop up saying `DIR,OPT/K`.

To use this tip, you'll have to load your StartUp-Sequence file into a text editor and add the line, `DATE ?`. If you now save your StartUp-Sequence back again and then reboot, the Amiga will ask you for the time. Simple but useful.

Getting along without a mouse

Amiga mice are delicate little creatures; when one does roll over onto its back and die, the machine is left virtually unusable. OK, so you can play StarGlider II, but what happens when you want to use the Workbench? Before you started reading this tip you would have been stuck!

It is possible to get along without the mouse using some very nifty keyboard shortcuts built into the Amiga. The first thing you will have to do is to press down on the right Amiga key and keep it pressed down. You can now move the mouse pointer around using the cluster of cursor keys.

That's all very nice, but what about the mouse buttons? No problem: while keeping the right Amiga key depressed, press the left ALT key for the left mouse and the right ALT key for the right mouse button.

Basil Pigg
Bath, Avon

BEGINNERS CORNER

This month we continue where we left off last month with our look into the darker depths of the Amiga's Command Line Interface. In this months exciting installment, we'll take a look at how the Amiga disk filing system works.

Disk filing system

The Amiga disk filing system is essentially made up of volume, devices and directories. Although you're probably wondering what this has to do with the CLI, it is essential for you to understand these simple principles before delving too deep into more complicated areas.

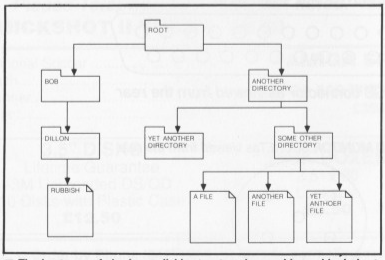
Volume sales

Contrary to what most non-Amiga owners will tell you, AmigaDOS is indeed a powerful beast. One example is the ability to name disks; nothing special in that (even the BBC allows you to do that), but AmigaDOS takes this one step further. AmigaDOS actually allows you to distinguish between disks by their names.

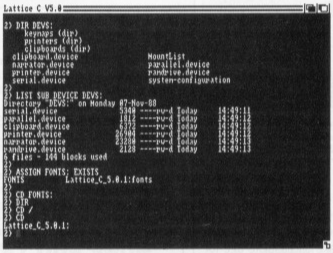
The only way of getting the user to insert a specific disk on other machines is to ask the user to physically insert the disk in a named drive. If the user inserts the wrong disk, the program will very often continue dumbly and try to read the required file from that disk even though it is the wrong disk. The Amiga, on the other hand, will prompt you to insert a disk of a particular name. If you insert the wrong disk, provided that the disk hasn't got the same name, the machine will reject it and redisplay the requester.

Don't drive my device

How do I access the disk in the internal drive even though I don't know the volume name? This is often a problem new Amiga owners encounter; thankfully it can be overcome very easily by understanding how the Amiga handles devices.



■ *The best way of viewing a disk's structure is as a hierarchical chart. This chart allows you to see how each directory relates to the next.*



■ *Does the CLI baffle you? Read Beginners Corner and you could end up talking about BCPL file handles with the best of 'em!*

When a disk is in a disk drive, the Amiga is able to access that disk through two routes: it can either refer to the floppy disk by its name as discussed above or it can directly access the disk by referring to the drive that the disk is inserted into. The latter is similar to the method used by machines such as the ST. The computer has no idea about the actual floppy disk itself, but instead refers to the disk drive hardware. This method may seem limited, but can often be very useful.

Directory dealings

In the darker days of home computing – when Commodore made disk drives such as the aged 1541 (yes, the ultra fast one) – the files on a floppy disk where all located on the same directory level. Disk operating systems have become more powerful since then. With the Amiga it is possible to group specific files into a number of sub catagories and store them in *directories*.

A disk containing files within directories is best likened to a hierarchical chart. Every directory branches off from a parent directory or root directory of the disk. If you wished to gain access to a file called RUBBISH – held in a directory called DILLON which in turn is contained in a directory called BOB – you would have to travel down through both directories before you could access that specific file. So, the file RUBBISH is in directory DILLON which is in directory BOB which is in the root directory. This sounds complicated, but moving through directories soon becomes second nature.

As promised last month, next months installment will see us actually starting to use those strange commands hidden within the Workbench C directory. Hang in there...

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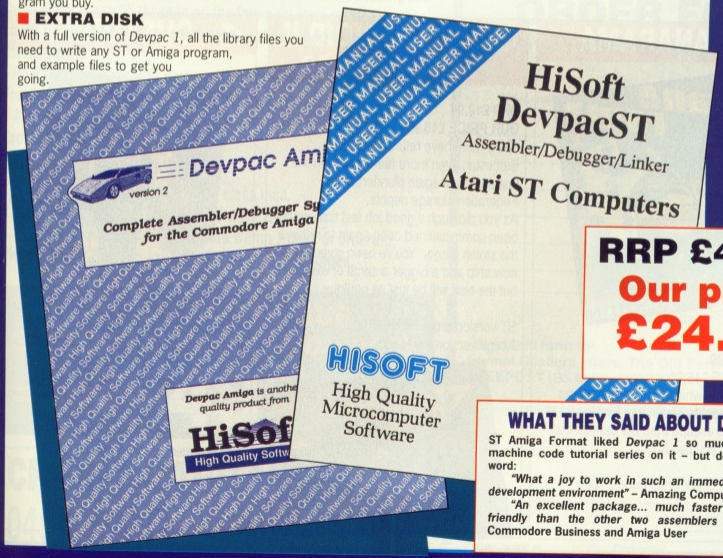

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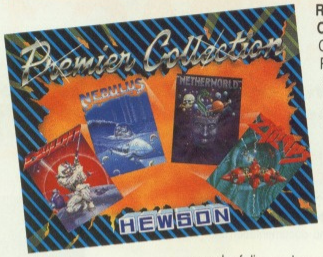

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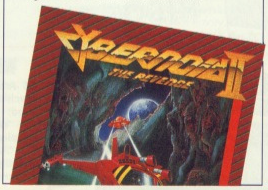

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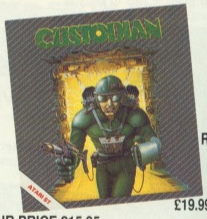

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FORMAT LETTERS

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Breathing space

Having recently purchased an Amiga 500 to further my BASIC programming from the level I achieved with an amstrad CPC, I have to admit that I believe the Amiga to be running an inferior BASIC to the CPC's.

My main reason for buying an Amiga was the increased memory available for my programs, after all 512K is fairly large, but alas I can only use 25K of this. My Amstrad gave me 48K. On reaching a stage well surpassed by Amstrad version, I find the machine coughing up an 'Out of Memory' error when only a few tasks had been completed. So I turn to the clear command to save me by executing a `CLEAR ,50000` statement before running my program. But, horrors! I am then faced with an 'Out of Heap Space' error after setting up only two output windows for my program.

Not knowing where to turn, I postpone my programming and write to you hoping you can help me out of this mess. To me at this stage it seems that I would have been wiser to keep my Amstrad than have the increased expenditure of purchasing an Amiga.

Please help me to recover my confidence in the Amiga's BASIC capabilities.

Kevin Weaver
Worksop, Notts

■ *You're almost there, the CLEAR command is the one to use. The 'heap' is the memory left for BASIC to use after you've reserved your program text area space, so* `CLEAR ,50000` *obviously isn't leaving enough. Try trimming the '50000' down to as little as you really need.*

Alternatively, try freeing more memory up by not loading Workbench. If you know how to do it, edit your Startup-sequence file (in the s directory) to remove the line `LoadWB` *and run AmigaBASIC from the CLI prompt. This should save you a good bit of memory.*

Mandelbrot on the landscape

I would be grateful if you could help me with a couple of queries regarding my Amiga A500 computer.

The first concerns the fractal scenery demonstration program included on the disk presented with the last January edition of your magazine. Basically, how is it done? I know that the Mandelbrot equation may come into the answer somewhere and perhaps this question may prompt you to write an article on this subject explaining, in not too technical terms, why and how the program works.

The other question concerns the analogue RGB output from my Amiga which I have wired up into my TV/RGB Monitor. When using the computer via the TV modulator into the TV section I had control of the colour saturation via the colour control on the TV (the sound volume also was control-

Old time virtues

I have just bought ST Amiga Format, having never seen it before – living as I do in wildest Wales – and am very amused by and sympathetic with your letters!

I am a grandmother but have been used to computers since the prehistoric days of learning to program a computer that occupied a whole building and didn't know as much as the ZX81. That was in the 1960's. My son progressed from the ZX81 to the Commodore Vic 20, then to the 64 and I learned to program them, and even for a year acted as playtester for SSI in the USA. They'd had so many problems with shipping their games over here and had no 'feed back' from the European Market – they found quite a few faults in their systems as a result, not that they seem to have learned from them!

In July I was left a small legacy and my son was leaving home complete with 64 – what was I to do without a computer? After much research I bought the ST 520 FM Summer Pack and several games and printer; I thought I was set now to do all I wanted – play games and write a book etc. But then my problems started. The ST is a marvellous machine and I'm very pleased with it. Just one very annoying complaint. Some games will not play, and after long drawn out phone calls at great expense I have found out why. The games that won't play (eg *Dungeon master, Deja Vu, Shadowgate* and now *Heroes of the Lance*) all have the same type of copy protection – they access a certain part of the disk.

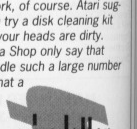
No one will admit to it openly but apparently the fault lies in the computer's disk drive which is out of alignment. This is due to the fact that the demand for the Summer Pack was so great that Atari imported a lot of machines from Taiwan and sent them straight out without testing. As far as I can make out about a third of machines have the same problem.

When I enquired about having the disk drive realigned I was told by Silica Shop either to wait until it was out of warranty and have it realigned myself, buy a second disk drive or send it off and wait 2 to 3 weeks! How's that for after sales service! Surely testing a machine before it was sent out would be easier, quicker and simpler than all this hassle!

Mrs Celia M Taylor
Pencader, Dyfed

■ *You aren't the only one to write to us reporting a dicky ST disk drive. It seems that Atari have installed many different models of drive in the STs over the years, presumably shopping around for the best price. Some drives seem more tolerant than others. Officially, Atari don't know of any problems, except that some people try to run Summer Pack games (which are double sided disks) in older STs with single sided drives. They won't work, of course. Atari suggest you try a disk cleaning kit in case your heads are dirty.*

Silica Shop only say that they handle such a large number of STs that a 2 to 3 week repair time is the best they can manage.



lable). However, I have no control over colour via the RGB output since the TV colour control has no effect. (The same was found with volume control but this problem has been overcome by wiring in a potentiometer between computer and monitor). Some colours in programs can be quite garish, and the ability to tone them down would be useful. The TV contrast/brightness controls help, but I would be glad of any advice you could give.

I G Main
Aberdeen, Scotland

■ *This isn't the place for a treatise on fractal geometry – suffice to say that maths really can be beautiful, despite what you may have thought at school! We may run a short article on Mandelbrot patterns, revealing all in the future.*

As to your colour problem, there's no simple solution apart from using 'Preferences' to alter the palette of the Amiga. Or use a pair of sunglasses.

Are you mad?

What on earth is going on down-there? Everybody is screaming that *Operation Wolf* is arcade-perfect and you say it's slow and boring? Where on earth did you get the courage to give *Thunderblade* overall 92% (issue 7)? When you read the review you get the idea that it is a world class game. I think that *Thunderblade* is almost unplayable due to the double function (altitude & speed) of the fire button and very slow movement response. I don't know who (or what) to believe?

The big fault of most 16 bit games is that they rely on flashy graphics and sound (well, we *are* talking about 16 bit machines aren't we?) but forget the playability! US Gold is producing more and more junk covered with lots of hype. Some names? *Street Fighter*, *Pepsi Challenge* (ha, ha, ha!), *Out Run* and *Thunderblade*. Meanwhile Ocean is recovering from the same sickness with great games like *Operation Wolf*, *Batman* and hopefully *Robocop*.

I liked the review on the scanners in issue 8, but who can afford to pay over £200 for a DTP toy? I know a cheap (about £85) scanner that you plug on a printer head and which can cope with 150 (16 grey scales) and 216 (mono) DPI. It's called Iris, and more info can be obtained at: START, uitgeverij Divo, M. Gijzenbury 14, 2907 HG, Capelle a/d yssel, The Netherlands

START is a Dutch magazine for the ST; a bit more serious-minded than STAF. I think it's great value. (I have no connections with START in spite of the fact that I live very near them!)

Jay Lee
Capelle a/d yssel, The Netherlands

■ *Well, if everyone had the same opinions the world would be a dull place. Thanks for the info on the START scanner.*

Promises, promises

I find it strangely ironic that Commodore should now be suffering from the same shortages of DRAM chips that afflicted its competitors last year, especially as, at the time, they took so much trouble to highlight the irresponsibility of these companies in allowing themselves to be so badly affected. I wonder if the smug looks on the faces of the people at Commodore have now been replaced by worried frowns?

This phenomenon isn't isolated to hardware manufacturers alone, it is also prevalent in software houses. I remember seeing an advert for *Tomahawk*, by Digital Integration, and then having to wait well over a year for the game to be released. Many full page adverts appear months before the software, sometimes years, and accompanying them are order forms which lead readers to believe that the product is ready. Another recent example of this is *FOFT* by Gremlin, advertised early last year and now only just available. This applies to dozens of games by different software houses. Advertising a game that is far from completion is tantamount to lying in my opinion.

I am an Amiga owner, so my feelings are not naturally biased against Commodore. In my view they have produced, in the Amiga, one of the best all round computers that money can buy, and in that respect I must thank them. The point of my letter is that I, along with many other computer owners, am sick to death with

prints of darkness

I have just bought a citizen 120D Printer, and so I tried it out on *DPaint*. I drew a picture and clicked on 'Print' in the menu. After about 30 seconds the printer started up, but all it printed was a series of numbers and letters. Is there something wrong with the printer, or my *DPaint* package? I got *DPaint* free with my computer. in the manual for the printer it gives no program for the Amiga 500, so could you give me one.

Scott Orchard
Bournemouth, Dorset

■ *You've probably not set your Amiga up to expect the correct printer. Once you've started up with your DPaint disk, run the Preferences program and select 'Epson' or 'EpsonX' from the menu of printers. Now click on 'save', and DPaint should work fine. (You only need to run Preferences once, after that the change will be permanent.)*

I am the proud owner of an Atari ST 520 FM. I looked at your survey on black and white printers, so I went out and bought a Citizen 120D. It works fine, but the Atari ST is allowed a maximum number of characters in a string.

When I type something into the computer I often use more than 255 characters so I have to start a new string, carrying on from where I left off the last string. Finally, when it comes out on paper, the strings containing my sentences aren't joined up, eg:

```
10 LPRINT
"aaaaaaaaaa...."
20 LPRINT "aaaaaabbbb..."
```

On the printer, instead of this:
aaaaaaaaaaaaaabbbb
it comes out like this:

aaaaaaaaaaa
aaaaaaabbbb

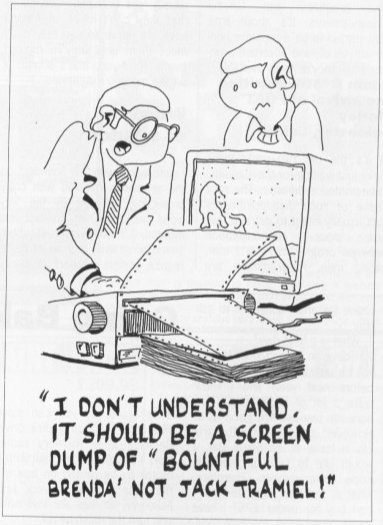
Could you please give me a command which will join up the strings?

A Alexandrou
London

■ *Whether you're printing to screen of printer, the PRINT statement will always do a new line after it has printed it's message... unless you put a semi colon after it, which means, "Whoa! Leave the cursor where it is 'cos I'm agonna print some more!" So, change the first line to read:*

```
10 LPRINT"aaaa...";
```

You should be OK now.



Future perfect?

As STs and Amigas replace the subject of weather for small talk, what do you think will replace the ST and Amiga in the next century? Do you know how far the development of computers using light instead of electricity has progressed since the construction of logic gates?

I read in an educational manual on microprocessors that research into a 64 bit processor is occurring – is this a hoax or old news? Will it mean booming coffee sales as people stay up to use mindblowing software?

J Futcher
Trowbridge, Wiltshire

■ *Wow! Talk about big questions. The most recent innovation I've heard of in computer circles is the molecular microprocessor. Bell Labs in the states have managed to make a switching circuit made of organic cells which is only a few nanometres across. If these can be successfully combined, the size of microprocessors could drop by a hundred or thousand times, with a corresponding speed increase. Imagine* Stargliger 2 *on that!*

64 bit processors will undoubtedly come (the Cray supercomputer already uses one). However, it's not how many bits you have but what you do with them that counts – for example, the Amiga scores over 8 bit computers mainly due to the quality of its graphics and sound hardware.

If any readers have a manifesto for their ideal machine-of-the-future, we'd be interested to hear. Just because it's impossible don't let that hold your imagination back!

prize letter format

false promises and fanciful announcements. It's about time they started to be a bit more honest with us all, and advertise products when they're really available.

Adam R 'Still awaiting the arrival of FOFT'
Morley
Leicester, Leics.

■ *It's the old two-weeks-away-we're-just-waiting-for-the-manuals-to-be-printed syndrome. The root cause of such disappointments isn't usually intent to defraud, but just poor communication between programmers and marketing men. Programmers are usually set unrealistic deadlines that they can't meet, and don't have the nerve to say they can't meet them until they've missed them! (Mind you, that's sounds a bit like monthly magazines...)*

Words of wisdom

I quite agree with D R Saunders on the problems involved with copy protecting software by the 'key word' method. Over the last few months, I have purchased about seven programs, and six of these require certain numbers or words to be typed in.

I find it a real pain to keep all these manuals lying around, and I never bother to back up the disks anyway. Why don't software houses do the following:

Copy protect their software in the usual way – using 'funny formats' on the disk – so that when the software loads it checks the disk and if it is correctly 'funny' the software works OK.

If, however, the check fails – because you've made a back up or you've got a virus – then the software should ask you to enter 'page 4, line 4, characters 97' or whatever. The software should give you three chances to get it right. If words are entered, a soundex rule should be applied in case the person is a bad typist or speller.

If this failed they could then put the software in a 'demo mode', locking out the user but giving them an idea what they are missing.

By the way, I think that Eidersoft should get some sort of award for their protection method in Pro Midi Plus – it always asks for the same word to be typed in!

While I am having my say, here is a quick message to Commodore:-

Going Bakwards

I have two main questions to ask you:

1. What is a RAM disk?
2. I have an Atari 520STFM (and will be upgrading it to a Mega 2 before next year) and I know quite a lot of BASIC and I can honestly say that I'm good at it. However, since reading the article in Issue 8, on Steve Bak, I would like to take up machine-code programming. Therefore, what is the best compiler that I can buy for under £75? I have never, ever used machine-code, and know absolutely nothing about it, so I need a good clear manual.

Congratulations on a really superb magazine. I get it every month; however the one criticism that I have is the amount of typing errors that occur. I managed to count 26 in issue 8, and 37 in issue 4, without searching for them!

Please could I also comment on the superb customer support offered by Computer Concepts. I needed help with *Fast BASIC* and they were totally superb!

B A Howard
Stanmore, Middlesex

■ *A RAM disk is simply an area of a computer's memory which is set aside so you can store files in it, just like a disk drive. Because it is memory rather than a physical disk drive with a motor to be turned on and off, file access time is very fast. However, all files are lost when you turn the machine off.*

The best machine code development system? Without doubt, HiSoft Devpac 2 at £59.95 (version 1 is on this month's cover disk).

Wee doant maek know speling mtsakes, matey. Not many, anyway. You'll be relieved to know we have a new production editor starting next month, so things should get a lot better!

After using Sinclair Spectrum micros for many years (currently the 128K version plus Disciple disk interface) I have recently bought an Atari ST system, and I have a few questions:

1. My Spectrum wordprocessor is *Tasword 2*, and I have many files stored on disk. They can easily be converted into ASCII data files, but can they be transferred to an ST wordprocessor, such as *1st Word*, via the RS232 ports of the two micros? If so, how is it done?
2. In Issue 8, Steve Bak writes that he uses a Mega ST to squirt data, via the RS232 ports, into a 520 ST. Could you please explain what this means, why it is done, and how it is achieved?
3. Finally, to satisfy your obsession with useless facts about armadillos, have you realised that you can turn them into a small radio?

Philip Byford
Hemel Hempstead, Herts

■ *Well, I don't know anything about the Spectrum but if it's got an RS232 port then there's no problem. You will need a Spectrum program to send text to the serial port and an ST program to capture incoming text and save it to a file. Then you need to get a serial lead (make sure the person who makes it for you knows it is for file transfer – serial leads for printers are wired differently and won't work).*

Once you've transferred the text, virtually all ST word processors can read ASCII files.

As for Steve Bak squirting files from Mega STs to 520s, it just means using a comms link to transfer data. And no, I can't think of any good reason why he doesn't just swap disks.

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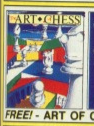

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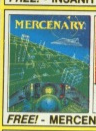

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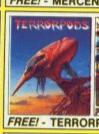

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Gavin Jones
Ashtead, Surrey

■ *I think your scheme is a bit too complex – pirates are getting pretty good at copying even weird disk formats, so you aren't addressing the real problem.*

And, yup! All your wishes for the Amiga make rock solid sense. Roll on Workbench 1.4, and let's hope Commodore are reading this.

Automatic lover

This is a cry for help from an absolute beginner!

I have studiously absorbed the contents of the ST Amiga Format since it first hit the scene – there's dedication for you! – particularly the letters section and the Desktop section looking for a way to make the AUTO folder work on my 1040.

In spite of following the advice given, I'm bootless! What am I doing wrong? Or what does everybody know that I don't?

Look at Issue 4 page 89, Beginner's Corner, last para: AUTO FOLDERS. Not for me! I have followed the directions exactly but it doesn't auto load. I have tried putting a .PRG on the Auto folder name – still no go. Help, please.

I would appreciate any instructions in easy to follow steps and in words of no more than one and a half syllables.

Bill Whale
Worthing, West Sussex

■ *It's really dead easy: to make up a disk which automatically runs a program, the first thing you need to do is create a new folder called AUTO. Now, most ST programs have filenames that end with '.PRG'. Suppose you want to autoboot ST BASIC – just drag the file BASIC.PRG into the AUTO folder, reset the machine and everything should go swimmingly. The only possible problem is if it is a big program which needs to use some other files – just make sure every file you need is in the AUTO folder.*

Disastrous jokes

I have two grievances from issue 8 on page 63. You refer to Clapham Junction and try to make a tasteless joke out of it. On the same note, on page 65 you make another tasteless joke about Armenia, so soon after the earthquakes took place. I was disgusted. I hope you do not print any other cracks like these. You had better print this letter or otherwise it's proof that you do not take any fair criticism and only print letters which praise you.

Rahim Chitalya
Hornsey, London

■ *Sorry for any offence caused... all our jokes are meant to be taken with a pinch of salt. The man responsible has been taken out and had his head stapled to a lamp post.*

Purple rage

I felt I had to write following the your February 1989 issue.

Like most of the purchasers I suspect, I was expecting a really good demo of *Purple Saturn Day*. Well, how disappointed I was.

Consisting of some crummy screens in the form of a slideshow, and repetitive music, this has to have been the worst demo for a game I have ever seen. If Exxos hope to sell many games on the strength of this demo, I think they are in for a rude awakening.

As for yourselves, I am very disappointed in you for using this piece of inferior material as the main event on the Coverdisk. I hope that in future you are able to ensure that a truly worthwhile item is deserving of the honour of headlining the Coverdisk.

Stuart Hunter
Edinburgh, Scotland

■ *We normally try to make sure that our demos have a playable level to them, but Infogrames couldn't manage it for this one. Still, it's an excellent game and we can heartily recommend it.*

Decent cove

ST Amiga Format is without doubt breaking new ground in its innovative approach to the Amiga and ST. It is a pain in the neck to pay £1.50 or more for a monthly or bi-monthly magazine which as far as programming is concerned, only provides text and listings in 'C', Assembler or AmigaBasic. The CoverDisk idea is brilliant and compared with the expense involved in other ways of getting PD and Shareware, such as Modems with subs and phone bills to pay, it's a bargain.

The Fractal Scenery program was worth the price on its own. Some of the scenes are so realistic and resemble the Cornish coastline, I have named two scenes 'Mullion Cove' and 'Kynance'. And as IFF files they can be easily loaded into (lo-res) *Dpaint 1* and worked on to my heart's content.

John Gray
Eastbourne, Sussex

Roll back the years

I would like to take advantage of your voucher scheme but unfortunately I can't travel back in time to 1988. Look at the reverse side of the vouchers and see. It states they must be received by February 28 1988 – Wallies!!

Andy Van-Korro
Huntingdon, Cambs.

■ *Watch out for next month's cover-mounted Tardis...*

Tick, tock

Could you please help me. Please, please, please tell me if there is anything wrong with my computer. When I switch it on the disk drive it makes a noise every two seconds. This goes on until I put a disk in. This has been going on since I bought it.

I bought it about six months ago from Silica shop. They sent me the US model, and I am worried about the resolution. I read in some magazine about a big black gap at the bottom of the screen (56 pixels). Has the UK model got higher resolution than the US model? If so will Silica shop change it for the UK model?

Zafar Ahmad
Newcastle upon Tyne

■ *Although you don't say, might I hazard a guess that you've got an Amiga? The ticking noise is just the computer checking its disk drive to see if anything is there... it's an annoying habit, and one that will stop if you put a disk in. The constant disk checking prevents you from doing silly things.*

There's no real difference between US and UK Amigas (apart from one or two keys in different places). However, because the two countries have different television standards (we have PAL, they have NTSC) US software only uses 200 lines of the Amiga's display. European software uses 256 lines, so more of the screen is full. It's the country of origin of a piece of software, not hardware, which determines the screen size.

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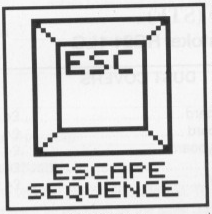

SCANNING SUCCESS

Judging from the 2,000 entries for issue 8's Cameron Scanner competition, there's a loads of you who want to digitise photos of your loved ones and touch them up (no, silly, the photos!)

Your mission, you'll recall, was to spot five differences between two pics of Agnes the office armadillo. In the second pic, Agnes is sticking out her tongue; she's got a third claw on her front foot; a shortened tail; a fly on her tail; and her caption reads 'skinned' not 'scanned'.

The first two eagle-eyed readers out of the hat were Amiga owner Mr. N.B. Corrigan of Little Billing, Northampton, and ST-er Jonathan King of Spring Park, Northampton. (Oh, didn't you spot rule 5: "All entrants must live in Northampton"?).

Thanks to you all for entering, and to Cameron for the prizes.

McKRACKING UP

Format is, of course, put together by an organised team of cool, calm professionals who never panic. And the Pope's my grandfather.

This month's cover disk certainly boosted the valium sales at Bath chemists. US Gold agreed to run a demo of Lucasfilm's *Zak McKracken*, and the disk deadline came and went without any program arriving. "Oh, didn't we say it was coming from the States? Tell, you what, we'll have it modemmed across to save time." A modem? Over the Atlantic? With more crackles than a bag of pork scratchings? "Sure, we always do it," they said.

We rang Lucasfilm in the States to confirm things, and asked how they coped with error detection on a modem. "Gee, I dunno. We ain't never done it before." Ulp.

So if there are any glitches in the demo, a haddock nibbled the phone line at the wrong moment.

NEXT MONTH

The magnificent May issue of *ST Amiga Format* muscles onto the shelves on
THURSDAY 20TH APRIL
and we've already got a mean miscegeny of material on the menu. As well as all the unmissable regulars like machine code and animation tutorials, if all goes according to plan there'll be:

- **WHICH MONITOR? – Do you suffer poor quality TV displays? At last, the definitive guide to better ST and Amiga vision, from cheap monitors up to multisyncs.**
- **DIY SOUND SAMPLER – Build your own sound sampler for around £20! A simple kit which works with all STs *and* Amigas.**
- **PAINT PACK SHOOTOUT – It's Tyson v Bruno all over again: can *Deluxe Paint III* see off *Photon Paint 2*?**
- **CAD, SIR! – Graphics isn't just pretty pixels, you know. A look at the world of Computer Aided Design, plus review of *Professional Draw* on the Amiga.**
- **TOP GAMES – *Weird Dreams* and *Blood Money* top the May charts. The cream from the world's games houses is here.**

Superheroes, Inc.

by Sarkar

A BELCH* BASE. OUR HEROES ARE CORNERED...
GUESS THIS IS IT, OLD BUDDY.
WE'RE BOTH ALMOST OUTTA AMMO...
* BROTHERHOOD OF EVIL LUNATIC COMPUTER HACKERS
I'VE RIGGED THIS MULTIFACE ST WITH PLASTIQUE...
THIS IS A HACKER'S DREAM, REMEMBER...?
GREAT. SO...?
THOSE GOONS'LL GO FOR IT LIKE MORONS TO AN AMIGA...
THAT'S WHEN I'LL DETONATE IT!
HEY! BOZOS!
LOOK WHAT I'VE GOT!
ATTY! NO!
DON'T DO IT...!
A MULTIFACE ST! GIMME!
DON'T SHOOT! YOU MIGHT HIT THE MULTIFACE!
GET OFF MY TOE!
OW!
I CAN BACKUP ALL MY PIRATED GAMES!
SCRAMBLE!
BLAM!
ATTY! SOB!
HE SACRIFICED HIMSELF...TO SAVE ME!
THE DEAL I MADE WITH WH SMITH...
AFTER ALL I'VE DONE!
TO DROP THE ST!
SO! YOU WERE BEHIND THAT!
WHA...
I THOUGHT YOU WERE DEAD!
YOUR LOVE BROUGHT ME BACK, SCHMUCK!
THAT AND MY BOMB-PROOF COSTUME!
PAF!
URF!

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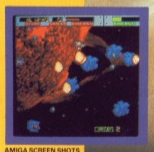
BLASTEROIDS



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